THE

Practical Teacher

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'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'—COWPER.

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The Teacher's Health.

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INTRODUCTORY.

POPULAR medicine, sufficient for the ordinary circumstances of school-life; could not be considered in all its phases in 'Health at School,' and its companion volume, 'School Surgery.' The hygienic conditions which should regulate school buildings, and which act upon the inhabitants of those buildings, were fully gone into, with considerable detail in 'Health at School.' So also was the method of dealing with those diseases which are produced by insanitary conditions or surroundings, or which are liable to be spread from one person to another by reason of their infective character. The surgical side of school-life was fully considered in 'School Surgery.' We have dealt in that volume with the ordinary accidents which belong to boys and girls, those sudden emergencies which may require immediate consideration and energetic action upon the part of the teacher. He may be frequently called upon to act before skilled surgical aid can be obtained. We have endeavoured to put forward the course which should be observed in as simple language as can be used. But besides these classes of cases there are others, which are not considered to be connected with hygiene, and which cannot be included in the details which belong to 'school surgery.' The teacher too often suffers from their consequences as well as the pupils, and a knowledge of their causes, the means to be taken for their prevention, and their treatment is personally important to him. Their management is thought to belong more directly to the physician than to the surgeon; they are generally, but not always, more medical than surgical. In a considerable number of instances the conditions which give rise to them are possibly hygienic and preventable. Our object is, therefore, to lay down some rules upon general health, which may be useful or instructive to the teacher, may enable him to preserve his own health, and also prevent the incidence of sickness and other disorders among those children who are placed under his care. I propose to review the different ways in which school-life is more especially liable to disturb the bodily economy, by means of which it interferes with the comfort of the teacher, as well as is disadvantageous to the health of the pupils. This influence is especially liable to be felt by the different senses, and to interfere with their proper action; the body being injuriously acted upon by anything which may interfere with the proper development of any part of the nervous system, especially those deeper parts of the brain, in which the faculties of thought, of speech, of hearing, and of sight are situated. The seven senses, as they are sometimes called, will each come in for careful consideration, and the changes in action, and the diseases to which each are liable will be in turn discussed.

They are all greatly dependent upon a properly developed and well-nourished nervous system, without which the *'Mens sana in sano corpore'* cannot be forthcoming. I shall consider them somewhat in the following order.

The growth of the body as regards the nervous system, as well as of muscular development. We shall consider digestion, the derangements which may arise in consequence of the use of deficient or improper food, and the character of the food which children as well as adults require, for if the nourishment provided is wrong in character, the body cannot be strong or healthy. I shall consider the muscular sense as brought out by exercise, and the changes which are wrought in the body by its neglect or its excessive use. Connected with this part of the subject will be the consideration of the dangers which may arise from excessive muscular as well as mental strain, and that over-use of organs which the customs of school-life may bring about. I shall consider somewhat fully the requirements of the body as to sleep, and the conditions which give rise to sleeplessness. I propose to consider the treatment required to keep the eyesight in perfect order, and to remedy the evils to which the eyes are liable from improper treatment and over-use. The causes of deafness will be discussed, and the means which may be used to prevent or remove them. The throat and the voice will be carefully considered. The care of the mouth and the teeth will be noted. Some general directions will be given as to the use of family medicines in treating

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those disturbances of the general health which may not necessarily require the services of a regular medical attendant. Some directions will also be given as to the character of the clothing which children and also adults should wear as regards its incidence upon the form of the body; and, if space will allow, I propose to give a few general directions as to what teachers should not do if they wish to live to a good old age, and to enjoy the life which Providence has given them.

It has been said that a man is either a fool or a physician at forty. That is, if he does not know how to treat himself by the time he is forty years of age he is never likely to learn; and bearing in mind the rendering of Pope in his translation of the Iliad, '*That a wise physician, skilled our wounds to heal, Is more than armies to the public weal*' (book xi., line 336), it does seem highly important that those who have to educate the young of both sexes should be able to class themselves with those who are the nation's benefactors, rather than to give occasion to others to say with Young that '*A fool at forty is a fool indeed*' (Satire ii., line 282).

THE GROWTH OF THE BODY.

Given a young child of average health, and fairly free from the consequences of immediate hereditary disease, how is that child to be developed into an adult without the production of mischief from improper feeding?

'*Ex nihilo nihil fit*,' 'Nothing can of nothing come,' is as true as is another Latin proverb—'*Ex quovis ligno non fit Mercurius*,' which is freely translated into one of our own, as 'You cannot make a silk purse out of a sow's ear.'

To develop a child into a healthy adult requires a proper kind of food. This is necessary for three distinct purposes. (1) To sustain the body without diminution of the energy which it has already obtained, (2) to attend to its growth, and (3) to remove from it the consequences of its natural acts, or the *débris* which result from their performance. The body is precisely like a steam engine: if you wish to have it ready for use, you must keep up the steam at an expenditure of fuel; if you wish to 'conserve its energy,' you must use more fuel than is required for the simpler purpose of preparation for use. The result of these operations is the formation of ashes in the ashpit, and *débris* among the machinery, which have to be cleared away by the attendant firemen. In the case of the engine these attendants are outside its ordinary mechanism, but in the human frame they are parts of it, and are self-acting.

Let us ask as to the requirements for these purposes. Mr. Grove has made us acquainted with the *correlation of force*, that light, heat, electricity, chemical affinity, motion, and magnetism are convertible; that either may, under certain circumstances, produce the other, and that neither can show its presence except by the previous manifestation of some antecedent force. To give effect to these manifestations there must be a *conservation of force*. We mean by this term a storing of power, a power of producing energy, and by energy a power of acting, *actual* energy being that which is actually at work, *potential* energy being that which is ready for work when it is wanted. We must bear in mind that there is no possibility of destroying anything in nature, and that all the changes which are incessantly going on in the body, made up as it is of millions of cells, each of which is doing something, give rise to manifestations of power either for good or evil. Sometimes there is a conservation of force, sometimes the store is dissipated. How this comes about may be illustrated by reference to the effect of heat. If we take a pound of water at 0° C., and another at 79° C., and mix them, there is a mean temperature of 39·5°. But if the first pound is ice at 0° C., instead of water, the whole is still 0° when the ice is melted, the heat has become latent, and there is a conservation of force. Several other illustrations might be given to show how force is conserved. It may be weighed and measured. It has been so worked out by Mr. Joule, so that we are enabled to make heat and motion into convertible terms, and to measure or weigh the one against the other. Heat may be easily changed into light. Sunlight being the prime factor by means of which the world rolls along, and '*Laws wise as Nature, and fixed as fate*' continue their course in one incessant work of change. Light into heat, heat into motion, motion into electricity, the last back into light again, varying the process accordingly as it may be necessary to build up, to store for future use, or to pull down again, or to use up at once, in carrying on the functions of life. It is for these varied purposes that food is required. The natural heat of the body must be kept up to its natural standard. How this comes about is one of those facts which are connected with the so-called vitality of the body, and which are ever likely to be beyond our ken. Why the healthy standard should be 98·5 F., why if it exceeds that standard there is so-called fever, and why death results if it is materially lowered or raised we know not.

A great part of the daily and immediate necessity for food is to keep up the standard of temperature. Those foods, therefore, which contain the larger proportion of material capable of being burnt up in the body are those which nature dictates to us as most suitable for daily use. This class of food contains conserved energy which has been stored up and fixed in a latent condition ready when we want it. Vegetable products, for instance, have stored up a supply which has had its source from the rays of the sun; a combination of atoms is brought about, which, when acted upon by the agencies contained in the body, set those rays free again in some other form. The carbon and the hydrogen which exists in their structures in one state of combination are made to enter into another, and heat is set free by their oxidation. Similarly our coal-fields are simply a vast magazine of the sun's rays which have been stored up in past ages for present use, and are now brought out to assist in performing all those mechanical movements which distinguish the present age from all its predecessors.

But there is a necessity for something more, oxidation alone will not provide for all the requirements of the body. The result of carbon oxidation is the production of carbon dioxide, and carbon oxidation is an action which is antagonistic to that performed by vegetable life. Vegetables absorb Co^2, and by the power of the sun's rays are able to fix the C again in the tissues of the plant, giving out the O to the air; animals take in the O and use it in oxidising the C and acting upon the other elements which make up the mass of animated nature. Only a limited number of those materials which are called *the elements* enter

into the constitution of living bodies. Carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, chlorine, sodium, potassium, calcium, and iron are the principal ingredients. Foods are required to provide these constituents. Their chemical constitution must be in accord with this list or they will fail to be of use as foods.

(To be continued.)

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How I Teach Latin.

BY REV. A. D. CAPEL, M.A., CANTAB.,

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IN these days, when so much is trying to be done to simplify education in science and other subjects, it seemed hard to me that something could not be done for boys in their first struggles with Latin. This was the task I set myself, some few years ago when engaged in teaching young men. Since that time I have had some young children placed under my care, and have tried my plan with most hopeful results. Harmony masters seem to think and hope that all their many rules with their exceptions will eventually be reduced to very, very few; and in the same way as the sinking of lead in water and the rising of cork in the same fluid, are now known to be owing to the same cause, so these rules of harmony, with their exceptions, will be shown to be equally attributable to one and the same law of sound. When one thinks of the number of forms and rules a child has to commit to memory in the first two or three years of its acquaintance with the Latin language, one wonders almost how it ever succeeds in learning anything at all.

Some men would urge that the principal uses of the primer are to learn, not the science of language and the idioms of Latin, so much as that there are disagreeable things in the world, which must be done, and certain people which have to be obeyed. In these high-pressure days the time has gone by for simply this moral use of the primer. When we consider how much more, how many more subjects a pupil is expected to know something at least about, and how high the standard of examination has become for entrance to many of our great schools, surely we teachers ought to do all we possibly can to lighten the labour of the pupil in every compartment of study.

With regard to etymology, I teach my pupils to build up their own grammars, showing them how and on what principles tables of inflexions are made.

After having explained that the Latins used cases with different forms, where the English use prepositions, I teach them that nearly all nouns can be classed in one of five ways of making these changes, according to the favourite or characteristic letters found in them. And then, having shown them how to find out to which class they belong, I show them how the accusative case is formed, for the present coupling together the second and fourth, or o and u declensions, and the third and fifth, or i and e. I next (in this particular following that, in many ways, admirable little book of T. K. Arnold) show how the 3rd person singular of A verbs, as far as the present, imperfect, and future tenses is formed. I take a word like 'saltabat' (he was dancing) and show them that the final 't' means he, she, or it; 'ba' preceding the 't' means 'was' (when followed by -ing); the 'a' is the characteristic vowel of the verb, and lastly the 'salt' means dance. Next must come the analysis of a simple sentence—containing a subject verb and object—and the fact that the nominative case is used for the subject of the sentence, and the accusative, for the object of the active verb. At this point a child is in a position to translate little sentences both from Latin into English and the reverse. The former should in every exercise be put first. I do not insist upon rules of order at present, but allow pupils to follow the English order. The other three conjugations may now one after the other be treated in the same way. After this I alternate the learning of a new person in these tenses (showing that 'mus' at end of verbs means '*we*,' 'tis' '*you*,' etc.), with the endings of the other cases. Of these the genitive singular had better be learnt before the dative and ablative. The endings of the genitive singular being the only case which differed in every declension, used to be used as the distinguishing case, and is still found in all dictionaries, so as at the same time to teach the root of the noun as well as what declension it belongs to. Until our dictionaries are all rewritten, we must still press the importance of the genitive case from an etymological point of view.

When we come to the dative case we can show that the termination is really 'i' preceded by the characteristic vowel—'ai' becoming 'æ,' 'oi' becoming 'o' and 'ii' becoming 'i.' Pupils cannot be taught too soon to examine how these euphonic changes are effected. In this way, with regard to nouns my pupils in the course of a few days were able to write down a complete scheme of nouns, from which they could read out the declining of any noun or adjective.

The following table shows the connection between the five declensions—the changed forms *generally* used being inserted underneath in brackets:—

Old numbers	1	2	3	4	5
Characteristic Letter	a,	o,	i,	u,	e
			SINGULAR.		
Nominative and Vocative—Word found in vocabulary					
Accusative in m	am,	om (um),	im (em),	um,	em
Genitive all different	æ	i	is	us	ei
Dative in i	ai (æ)	oi (o)	ii (i)	ui	ei
Ablative characteristic	a	o	i (e)	u	e
			PLURAL.		
Nominative Vocative same as gen. sing.	æ	i	is (es)	us	ei (es)
Accusative in s	as	os	is (es)	us	es
Genitive in rum	arum	orum	irum (ium),	urum (uum),	erum
Dative and Ablative in bus	abus (is),	obus (is),	ibus	ubus (ibus)	ebus

In addition to this, all that he need learn so as to be able to decline all regular substantives and adjectives is (1) That the accusative of neuter nouns is the same as nominative; (2) That the nom. voc. and acc. plural of neut. nouns end in 'a;' (3) That the vocative sing. of 'us,' nouns in 'o' declension, ends in 'e,' except when 'us' is preceded by 'i,' when voc. sing. ends in 'i,' *e.g.* filius *v.* fili; and (4) That the genitive plural of 'i' nouns generally drops the 'i,' if the root has as many syllables as the nominative sing. I make my

pupils write out this scheme of nouns every morning (it does not take above five or six minutes), and from it *read* out every noun that occurs in their lesson. In this way I find the nouns soon become very familiar.

During the learning of these noun forms, the pupil has been gradually learning the pres., imp., and fut. of the four conjugations, beginning in all cases with the 3rd person singular (a far better person than the 1st; in fact, the 1st is the very last I teach, as, excepting in the perfect tense, it is the only person that has more than one form). I next introduce the pres. and imperfect subjunctive in the same way, but only when translated by 'may' or 'might.' I also introduce a few prepositions and more common conjunctions when the Latin idiom is the same as the English. I find when children begin to translate little fables or connected sentences that a fair knowledge of the conjunctions is invaluable.

I next attack the perfect roots of verbs of 'a,' 'e,' and 'i' conjugations, leaving the more difficult short 'e' conjugation to be gradually learnt with the pronouns and comparative adjectives. Here, again, I show them how every part of the word is translatable, *e.g.*, saltaverit, 'he will have danced.' The 't' is 'he'; 'eri,' 'will have'; 'av' the 'd' at the end of 'danced'; and, as before, the 'salt' meaning 'dance.' As the child gradually learns these tenses he has to make a scheme of the 3rd person singular, and write it out every day, and from the third person give the other persons until he can say the whole tense.

The scheme is as follows:—

Old Numbers	1	2	3	4	
Char. vowel—	a	ē	ĕ	i	English
Present—	at	et	it	it	—is, or does
Imperfect—	abat	ebat	ebat	iebat	—was

etc., etc., etc.

I then point out especially the three '*et's* and press the necessity of knowing to what conjugation the word belongs, before trying to translate the word. There are a few variations of course to point out, but these few, especially pointed-out facts, are as nothing compared to the old wearisome, mindless method of learning the four sample verbs. And in learning etymology in this way we must remember that the boy is using his mind and not only his memory—in other words, he is not only being *instructed*, but also *educated*. Under the old method of learning grammar, many boys could mechanically say their lessons, scarcely conscious of what they were doing, much less saying. As an Examiner, I have too often found that he is the biggest fool in the school who can most easily commit to memory a vast number of lines of poetry or repeat lists of exceptions. Such boys depend on their memory. Put them one iota off their particular track, and, to use their own words, they must begin again. How often one hears a boy mumble to himself a whole tense to get at the Latin of 'They did so and so.' If the pupils have made their own grammars, it is wonderful how far more easily they can apply it in translating from Latin to English and *vice versa*.

On examining the ordinary rules of Syntax supposed to be learned and remembered, I soon found how many could be linked together into one. Take, for example, such rules as (1) the following of the verb 'esse,' 'to be,' by the same case as precedes it, (2) the following of verbs of 'being named,' etc., by the nom. case; (3) the laws of apposition; (4) attraction, and even others: can they not be all included in the common-sense statement that 'Two words in the same sentence, referring to the same thing, are put into the same case.' A very few rules like this, together with a grasp of the force of the six cases—an idea of an absolute case—and a comprehensive view of the sequence of tenses, and I find nearly all the Syntax is gradually and almost imperceptibly learnt.

At this point, not earlier, I take up the difficulty of a partitive genitive and the English use of the infinitive, showing how it differs from the Latin use. I teach my pupils to ask themselves, with regard to an infinitive mood, as to whether it answers the question What? or Why? to the principal sentence. If What? the infinitive mood is a substantive, and remains in the infinitive mood in Latin; but if the English infinitive answers the question Why? the infinitive must be turned into 'that it may,' etc., or 'that it might,' etc., and of course put into the subjunctive mood—and even with the exceptional verbs 'ask,' 'command,' etc.: the subjunctive clause really answers the question Why? to the principal clause rather than What? as in 'I ask you to do this.' Why do I ask you? Answer, that you may do this.

(To be continued.)

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Physiology.

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SUPPOSE we have before us a hen, a geranium plant, and a lump of sulphate of copper (blue vitriol, as it is commonly called). In what respects do these differ from one another?

You all know that the hen feeds chiefly on such things as corn and worms. Perhaps you are not aware of the fact that the geranium cannot take solid food into its interior, but absorbs salts dissolved in water from the soil, and carbonic acid gas from the air, of which it retains the carbon and liberates the oxygen. But although the nature of the food differs in the two cases, the hen and the geranium agree in the fact that the food does not remain as it was absorbed, but is worked up into more complex compounds before entering into their constitution. In virtue of this *assimilation of foreign materials into their interior*, the geranium and hen possess the *power of growth*.

Turning to the sulphate of copper, we find that this has no power of elaborating substances received from without into more complex compounds. True, it can grow; for if a lump of sulphate of copper is placed in a strong solution of the same salt, the solid salt will increase in size. But this growth differs essentially from that seen in the hen and geranium in two particulars—1st, the growth is by accretion, *i.e.*, the simple addition of layer after layer of the same salt to the outside. Imagine a hen that grew by simply piling its food on its back! 2nd, The materials added are not altered in character. They remain exactly the same as they were in the original solution. Imagine a geranium composed simply of the salts and carbon with which it is supplied, or a hen whose flesh consists simply of the corn it has eaten!

You know that the hen lays eggs, and that these eggs will, after a period of incubation or hatching, produce chickens. Similarly the geranium developes seeds, which, under favourable conditions, will produce other geranium plants. Now turn to the sulphate of

copper. If you break up a lump of this substance, it is true that you obtain several instead of one lump. But the original lump has suffered in size, in order that the number might be multiplied. In the geranium and hen, on the contrary, after the production of seeds or eggs, as the case may be, they remain as large and healthy as before. If instead of sulphate of copper we take a crystal or two of sulphate of sodium (Glauber's salt) and add them to a saturated solution of the same salt, at once thousands of crystals are produced. Is this comparable to the reproduction of geraniums or hens? No, there is really no analogy between the two cases. The crystals are not produced from the one crystal added, having been first built up into its substance, but from the solution of the salt. The crystal added simply serves to excite a process that might equally well be excited, *without adding any crystal*, by slightly evaporating the solution.

It is true that in the geranium and hen reproduction could not occur if no food had been supplied to them; but as we have already seen, this food is first assimilated into their tissues, and then from these tissues the new individual is produced.

If you take the hen in your hands, you cannot but be struck with the fact that it is warmer than the external air. In other words, it has the power of developing heat, which means so much *force*, capable of being transformed into other kinds of force. To take what is, after all, a very imperfect comparison, we may say that in the same way as the heat produced by the burning of coal in a railway-engine, is, through the intervention of steam, converted into mechanical force and motion, so in the hen heat is capable of transformation into mechanical and other forces.

In the geranium the development of heat is not so apparent, but the temperature of a plant is higher than that of the external air, and at the time of flowering there is some further increase of temperature. On the other hand, the growth of a crystal of sulphate of copper in a solution of the same salt would go on all the more rapidly the lower the temperature of the solution. Again, if you leave a piece of sulphate of copper in any given place for a week, you may be certain that, unless interfered with, it will remain there and will not have grown in the interval. A hen would be certain to have wandered away; and although a geranium would not have bodily moved away, you would find that in all probability it had grown considerably, and showed numerous additional flowers.

Thus the living geranium and hen are not held in bondage to the same extent by the physical and chemical laws of the universe as the salt without life is. The same thing is shown more clearly by comparing a dead and living hen. If the former is left for a week, it becomes offensive in the extreme. It has begun to decompose and putrefy. The living hen is able to resist the universal tendency of all complex organic bodies to such putrefaction. In the pancreas of the human body we have a much more striking example of this power of living tissues to resist ordinary chemical action. This gland secretes an alkaline liquid, which digests albuminous substances having the same constitution as the material of which the pancreas itself is composed. Why does not the pancreas digest itself? It does sometimes if death occurs during full digestion; but this accident never happens in the living body. In the stomach, again, we find the acid gastric secretion digesting substances identical with those composing the stomach, and yet the stomach escapes. It has been supposed that the alkaline blood neutralises the acid secretion, and so prevents the stomach digesting its own coats. No such explanation clears up the case of the pancreas.

Let us return to our three types. On watching the hen for some time, we shall find that feathers frequently drop out, and that it casts off from itself the waste products of its food and tissues. Similarly leaves, petals, and other parts drop from the geranium, their place being supplied by others. The sulphate of copper if left alone, will remain exactly stationary, neither gaining nor losing in weight or form. Thus we arrive at the conclusion that the life of any organism is constantly associated with a local death of used-up constituents of it; or stating the matter in another way, we may say that local death is a sign of life.

The geranium and hen have been taken as types of living things belonging to the vegetable and animal kingdoms, and what applies to them you will find applies to all other living things. We may sum up the *characters of living things* as follow:—

1. They have the power of assimilating food into their interior. By means of this assimilation they build up their tissues and grow.

2. They possess the power of reproducing their like.

3. They are the embodiments of force, and so are able, in a certain degree, to overcome and suspend the physical and chemical laws of the universe.

4. The life of the whole is shown by a continual death of individual parts.

Such are the characters of living things. Physiology is the science or knowledge which treats of the phenomena through which life is manifested to us. In other words, it treats of life and its conditions. We have given the characters by which living things can be distinctly separated from those without life. To give a definition of '*Life*,' not open to objection on some point, would be almost impossible. Many have been attempted, from that of Aristotle, who said, 'Life is the sum of the operations of nutrition, growth, and waste,' to that of Herbert Spencer, who defines life as the 'continuous adjustment of internal relations to external relations.' These, like other definitions given, are eminently unsatisfactory, and we must acknowledge that science is no nearer unravelling the mystery of life than it ever was. Although a definition of life, satisfactory from all standpoints, is impossible, it still remains true that the above characters separate living things from their non-living surroundings by a deep gulf that has never been bridged over. Spontaneous generation, *i.e.*, the production of a living thing from its non-living surroundings, is as unfounded in fact as it is improbable in theory.

An interesting form of life may be mentioned in passing, viz., *potential* life, as seen in eggs and seeds. This requires only favourable conditions, such as heat, light, and moisture, to become fully developed.

In examining all living things, whether plants or animals, we find that there is one complex substance constantly present in them and constantly absent from everything in which life has never existed. This substance is *protoplasm*, or *bioplasm* as it is also called (*protos*, first; *plasma*, model or image; *bios*, life). It is possible to have dead protoplasm, though this must have lived at some former period; but we never find

a living organism, whether plant or animal, that is not largely composed of it. This protoplasm has never been artificially made, and there is no likelihood that it ever will be. Even then there would be an infinite space between the dead protoplasm thus produced and the protoplasm contained in living organisms. *Protoplasm* is a complex semi-fluid substance consisting of a homogeneous matrix, in which are embedded numerous small granules. Chemically, it is composed chiefly of the four elements, carbon, hydrogen, oxygen, and nitrogen united into a molecule of about one hundred atoms, and nearly allied to the albumen which forms the white of an egg.

About 70 per cent. of its substance is water. We may describe protoplasm as the physical basis of life—not life, but the medium through which it is manifested. In plants there is a much smaller proportion of protoplasm than in animals; hence their vital phenomena are much less pronounced.

We can best study the vital properties of protoplasm in the *Amœba*, inasmuch as it is composed of a minute mass of protoplasm, existing by itself. This minute animal is found in stagnant pools and elsewhere; its length is only about $\frac{1}{2000}$" (Fig. 1).

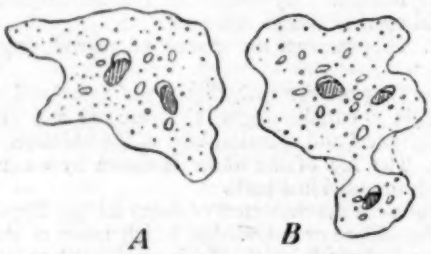

Fig. 1 a.—Amœba, showing pseudopodia, granules, and nucleus.
Fig. 1 b.—Shows process of separation of young Amœba by gradual constriction.
Both greatly magnified.

Examined under the microscope, we find it is almost structureless; it looks like a mass of jelly with a few granules, and one or two larger granules or nuclei in it.

It has no mouth, no stomach, no brain, or other organs. If watched carefully, it will be found to send out a small process or pseudopodium (*pseudos*, false; *pous*, foot) from the main mass; and the main mass by a sort of gliding movement, follows its own limb.

Thus it moves, and it executes these movements either on its own account, or when it is irritated by any external agent. If a small foreign particle comes in contact with one of the pseudopodia, it is soon surrounded and embedded in its substance, after which the pseudopodium disappears in the main mass of the Amœba, and if the particle is of a nutritious character, it is soon digested. What remains undigested, if any, is got rid of by a reversed process; the Amœba cannot eject the particle, but it gradually slides away, leaving the particle behind.

It is found that oxygen is absolutely essential to the life of this Amœba, and that it expires carbonic acid gas like all other animals. Occasionally the junction of a pseudopodium with the main mass becomes constricted more and more, until the pseudopodium is finally detached (Fig. 1 *b*). The new Amœba thus produced is able to carry on all the functions of its parent, and at once enters on a separate existence.

Summing up the characters of the Amœba, we find that—

1. It has the power of *motion and locomotion*, as shown by its changes of shape and of position.
2. It is able to *digest and assimilate food.*
3. It is able to *excrete waste matters.*
4. It is *respiratory.* It assimilates oxygen, and eliminates carbonic acid gas.
5. It is *irritable and automatic.* Movements result from external irritation or independent of this (*i.e.*, automatic). Thus we have here in a rudimentary condition the properties of nervous tissue.
6. It is *reproductive.*

We have taken the Amœba to illustrate and typify the properties of protoplasm. And what we have said about the Amœba is true concerning every animal in existence. It is not true to an equal extent for every plant. Let us therefore at this point examine the *differences between* the two great divisions of living things—*Plants and Animals.*

Take the example of the oak-tree, and the cow grazing near it.

Here the differences are much more striking than the resemblances. The cow has an alimentary canal, a nervous system, the power of locomotion, and is able to assimilate complex food. In all these and other points it is unlike the tree. But when we compare the lowest animals with the lowest plants, the ordinary tests will be found wanting.

Let us try such an application of tests.

1. *Power of Motion.*—Plants are said to be fixed, animals to have the power of motion. But there are certain microscopic plants (Bacteria) which move about freely in the liquid in which they live, while the corals and some other lowly organised animals are permanently fixed in one position.

2. *Respiration.*—Plants have the power of decomposing carbonic acid gas, fixing the carbon in it, and liberating the oxygen. Animals have no such power, but breathe out carbonic acid gas which the plants split up. We find, however, that this power of decomposing carbonic acid is confined to the green colouring matter of plants (called chlorophyll). Fungi (mushrooms, toadstools, etc.), though plants, contain no chlorophyll, and therefore cannot decompose carbonic acid.

3. *Chemical Composition.*—Plants are chiefly composed of the three elements—carbon, hydrogen, and oxygen, with a comparatively small proportion of nitrogen. In animals there are the same elements, with a much larger proportion of nitrogen. This being a difference only of degree, is obviously unfitted to form a means of distinction. A substance called cellulose, closely allied to starch, was formerly supposed to be peculiar to plants; but certain small animals called Ascidians or Sea-squirts are found to contain a material nearly, if not quite, identical with cellulose.

4. *Food.*—Plants live on inorganic salts, water, and the carbon from carbonic acid gas; animals can only subsist on organised food, obtained from plants or other animals. This distinction does not hold good on one side, as some plants, like the Venus's flytrap (*Drosera*), and certain Pitcher-plants, are distinctly carnivorous. It remains true, however, that no animal, however lowly it may be, is able to feed on carbonic acid gas and inorganic salts; and this is the only constant difference separating any animal from any plant. Its value is greatly diminished by the fact that the simple

organisms, about which there is doubt whether they belong to the animal or vegetable world, are very minute in size, and their feeding habits are difficult to observe.

It will be seen from this analysis of the distinctions between plants and animals, that the only reliable test consists in the nature of the food. The vegetable and animal sub-kingdoms approach each other very closely, and, according to some authorities, they overlap. In order to prevent confusion, it has been proposed to constitute a third sub-kingdom—a sort of 'No-man's Land,' in which all doubtful organisms shall be placed. This arrangement obviously would only be tentative, the doubtful organisms being assigned to the vegetable or animal sub-kingdoms, as their nature became more thoroughly known.

We have said that Physiology treats of the phenomena manifested by living things. But there are two kinds of living things—plants and animals; corresponding to these, there are two kinds of physiology—vegetable and animal.

The science which teaches us everything about plants is called *Botany* (*Botane*, Greek for grass); while that teaching us everything about animals is called *Zoology*, (*Zoos*, animal; *logos*, discourse); and the science common to both plants and animals is called *Biology* (*Bios*, life; *logos*, discourse); *Physiology*, in the strict sense of the word, only treats of the phenomena manifested by living things, or, in other words, their *functions*. To know *everything* about them we must also ascertain their structure or *anatomy*, and their relationship to other organisms or *classification*.] The following table will show at a glance the position of Physiology among the sciences:—

1. Inanimate Science, *e.g.*, Geology, Astronomy.
2. Biology
   - 1. Botany
     - 1. Physiology
     - 2. Anatomy
     - 3. Classification
   - 2. Zoology
     - 1. Physiology
       - 1. Human
       - 2. Comparative
     - 2. Anatomy
     - 3. Classification

In these papers we shall treat only of *Animal* Physiology, and more especially of this as it applies to the human being. A previous knowledge of the *structure* of the human frame is necessary in order to perfectly understand its *functions*. We shall therefore describe the anatomy of man so far as is necessary for an understanding of his physiology.

Practical Work.—Under this head we intend to give hints concerning the practical work involved in each lesson for both teachers and pupils. The practical work ought, as far as possible, to be done by each student, such as dissecting a rabbit, a sheep's heart, or an ox's eye. If a microscope is obtainable, each student ought to cut sections of liver, kidney, brain, etc., for mounting in glycerine, and viewing microscopically. All difficult points ought to be demonstrated by the teacher.

In the present lesson a few experiments may be performed and observations made.

1. Leave a crystal of sulphate of copper suspended by a thread in a solution of the same salt, and examine it in a few days. Take care to have some solid sulphate at the bottom of the solution, to supply the place of the sulphate added to the crystal.

2. Dissolve in distilled water as much Glauber's salts as the water will take up. Drop in a few crystals of the same salt.

3. Ask the pupils for other instances of local death in life, as the hair coming off in combing; scrape epidermis (scurf-skin) off your hand with a blunt knife, etc.

4. Show that life really exists in a bean by exposing it for a few days in a warm moist place. Watch the process of germination.

5. Take any decomposing liquid, as that in which flowers have stood for a few days. Put a drop on a glass slide, and place under the high power of a microscope, and watch Amœba.

6. Show that plants decompose carbonic acid. Place a large green leaf under an inverted bell-jar full of water. Expose to direct sunshine for a few hours. Bubbles of gas appear at the top of the inverted jar, and can be proved to be oxygen.

(To be continued.)

Julius Cæsar.

A. ROMAN PLAYS.—William Shakespeare has given us three. In order of time of issue these are 'Julius Cæsar,' 'Antony and Cleopatra,' 'Coriolanus.' The first stands, both in point of date and in manner, far apart from the other two. 'Julius Cæsar,' dealing with Rome under the Empire, was probably published in the year 1601. 'Antony and Cleopatra,' dealing with Rome still under the Empire that had moved a step further towards its doom, and dealing with Egypt, whose namesake, Cleopatra, was the doom of Antony, was produced about 1608. 'Coriolanus,' carrying us back half a thousand years, recalls Rome in her brutal, military greatness under the Republic, and this play would seem to have been written about 1610. Thus the two later plays lie together in point of time, and 'Julius Cæsar' is separated by seven years from either of them. And this agreement and disagreement in regard to time are paralleled by agreement and disagreement in regard to the manner of writing. 'Antony and Cleopatra' and 'Coriolanus' have many points in common in literary style. 'Julius Cæsar' is very distinctly different from either in literary characteristics.

B. THE SOURCE.—Shakespeare never invented a plot. He borrowed and made beautiful.

The translation of Plutarch's life of old Greeks and Romans, by Jacques Amiot, Bishop of Auxerre, which was in its turn translated into English by Sir Thomas North, is, as usual with the classical plays, the source of the chief events in 'Julius Cæsar.' Four lives especially are utilised by Shakespeare—those of Cicero, Brutus, Antony, and Cæsar. There would seem to have been another tragedy dealing with the same subject prior to the period of Shakespeare's handling. In the second scene of the third act of Hamlet, Polonius tells the sad prince how he enacted the part of Brutus at the university. This would seem to have reference to a play by one Richard Eedes. It was acted at Christ Church, Oxford, in the year 1582. The name of this same Richard Eedes appears in the 'Wits' Common Wealth,' a work of Meres, published in 1598. In the 'Wits' Common Wealth' Eedes is spoken of as a tragic writer. In 1602 it is known that a quartett of playwrights were busy conjointly upon a play entitled, 'Cæsar's Fall.' Monday, Drayton, Webster, and Middleton had put their heads together, after the strange fashion that was so usual in the Elizabethan time, to produce one of these dramas, that are not unlike Nebuchadnezzar's image. It is hardly possible that Shakespeare drew any inspiration from 'Cæsar's Fall,' but the date at which the four men above named were at work may help us in the decision of the next question before us.

C. DATE OF PRODUCTION.—The first printing of the play was in the folio of 1623. In that work 'Julius Cæsar' occupies twenty-two pages, and is favourably comparable with others, as it contains very few printer's errors. Probably the play was first acted at least twenty years earlier than the issue of the folio edition. 1601 would seem to have been the date of its production. It is true that in 1607 the Earl of Sterline delivered himself of a tragedy called 'Julius Cæsar,' a tragedy that ended with the death of Cæsar, not exhibited upon the stage as in the Shakespearean play, but only told in dialogue. The production of this play in 1607 and a resemblance that I cannot but think is purely accidental between a passage in another play called 'Darius' by the same writer, and the immortal 'cloud-capt towers' passage in the 'Tempest,' are sufficient evidence to some of that strange genus called critics, that Shakespeare's 'Julius Cæsar' was produced after Sterline's, and owed not a little to the work of that nobleman.

Far better evidence as to the earlier date of the production of Shakespeare's tragedy is furnished by Drayton. In 1596 Drayton published a work with the gruesome title 'Mortimeriados.' This contained lines in which there is a suspicion of the influence of Shakespeare's 'Julius Cæsar.' But in 1603 the same author published the same work remodelled and renamed. Its new name was the 'Baron's Wars,' and it does contain a passage that must either have suggested or have been suggested by the concluding lines in Shakespeare's play that have reference to Brutus. Again, in 1619, another edition yet more closely imitates the passage to which I make reference, and as Shakespeare was then three years dead, the increase of resemblance is not unnatural.

There is a peculiarity in the versification of Shakespeare to which the attention of the young student cannot be too early directed. As Shakespeare advanced in life, a habit grew upon him of ending his lines with words that were (1) of one syllable, (2) not emphatic. Such words may be illustrated by '*how*,' '*them*,' '*on*,' and '*is*.' Now these lines that end in unaccented monosyllables are very rare, are almost absent in the plays that were written before 1608. Not more than two such lines occur in any given play of earlier date than 'Antony and Cleopatra.' This last play has ninety-nine such lines; 'Coriolanus' has eighty-one. Those in the play we are about to study will be pointed out as we pass through its successive scenes, but every student is earnestly advised to make the attempt to find them out, ere our next issue saves some of that useful labour to the young lover of Shakespeare.

It would be well, also, if the student were to try to distinguish between the two kinds of these monosyllabic-ending lines. These are (1) light-ending lines, (2) weak-ending lines. The former end with an adverb, or a pronoun, or an auxiliary verb, each of which admits of a certain very light resting of the voice as it is uttered. The latter end with a conjunction or a preposition, admitting of no emphasis, even of the lightest. The number of heavy-ending lines in 'Julius Cæsar' is 2034, of light-ending lines 10, of weak endings 0.

The individual ones will be pointed out as we study the play, but the student is strongly urged to make an attempt to discover them for himself without extraneous aid.

D. TIME OF ACTION.—It is the time of the passage of Rome from the Republic to the Empire. When a nation passes in this order from one form of government to another—when it is first a republic, then under an arbitrary and an absolute rule—let us be assured that it is near its end. Its hours are numbered. The only succession that is hopeful to the peoples is from the absolute rule of the one to the free, co-equal government of the thinking many. The exact duration of the events of our play is from the middle of February, in the year of the city A.U.C. 709, to the year of the city 711 (B.C. 45-42). In the midst of the second month of the year 709 the Lupercalia (wild festival sacred to Pan, god universal) were held in honour of Cæsar, conqueror of nations. Then the crown was offered, and on March 15 he was slain. On November 27 of the following year (710) the Triumvirs met and drew up their proscription, so grim in its mutual accommodation (Act IV., scene i.), and in 711 the battle of Philippi ended the life of Brutus and the Roman Republic.

E. THE NATURE OF THE PLAY.—And here it will be wise to dwell lightly upon the periods into which Shakespeare's life as a dramatic writer has been divided. There is always something of the artificial about these divisions. But though the 'four periods' are as artificial as are all our systematic arrangements in science, they are of equal convenience with these. The first period (1588-94) contains such young plays as 'Love's Labours Lost,' 'Romeo and Juliet,' and the early historical plays, such as the two 'Richards.' The second period (1595-1601) has such riper plays as 'The Merchant of Venice,' with its deep passion, so lightly and yet so strongly set in a wealth of comedy; the Falstaff plays, charged full of a full humour; 'As You Like It,' where men and women 'fleet the time' brightly and keenly, 'as in the golden age.' The third period (1601-8) deals with tremendous passions. It contains 'Hamlet' and 'Othello.' Of the plays produced during this time one speaks, as De Quincey spoke of *Mater tenebrarum* (Our Lady of Darkness). 'Hush! whisper when we speak of her.' And in the dramas placed in the fourth period (1609-1613) a note calmer, but not less strong, sounds. Here—in 'Cymbeline,' and, most of all, in 'The Tempest'—man's laughter rings out as in the earlier dramas, and man's tears are flowing as in those of his middle life. But above the laughter and the tears you can hear the voice of a riper wisdom speaking of the peace and the harmony that, despite all ill, all sorrow, run through human life, and are growing more audible every hour as the world grows older. These only the elder ears catch, as only the elder eyes, or the keenest of the younger ones see, that all things are fashioning slowly towards happier times and happier things for man.

Shakespeare's play, 'Julius Cæsar,' comes under the head of tragedies. The student is here reminded that the division of the Shakespearian plays into tragedies, comedies, historical plays and farces, is as artificial as are most systematic divisions. It is said that the essence of the tragedy is pathos or human suffering, that the essence of the comedy is wit, that the essence of the farce is humour. Without pausing to inquire too curiously into the distinction between wit and humour, we make the statement that every play of Shakespeare contains all the three elements just named. In every one of his plays there is pathos, there is wit, there is humour. One of the three may predominate, and hence the particular drama may derive its name of tragedy, comedy, or farce. But all three are ever present. In the immense tragedy of 'Hamlet' you have the witty word-play of the Prince with his false companions Rosencrantz and Guildenstern, while cheek-by-jowl with the burial of Ophelia and the renewed meeting of Hamlet with his love, she being dead, we have the broad, farcical humour of the grave-diggers' scene. And in this, the blending of laughter and of tears, your Shakespeare is, as he ever is, true to the life of man. There also these lie side by side, and he, the greatest of painters of our manifold life, more than all others, has taught us how inextricably interwoven are sadness and joy. As we listen to his human teaching it is hard to tell whether the ripple-sound of human life is that of laughter of men and women, or of their tears.

'Julius Cæsar' is a tragedy. Its central idea is that of human suffering. And the suffering is in this play so tremendous, the characters are so gigantic, the events so central in history, so stupendous in their causes and their consequences, that it is no small matter for wonder that here, in this play, the mirth-moving qualities of wit and humour are less noticeable than in others. Yet even in this drama, that deals with the strife of emperors and of the kings of men contending under the shadow of the buildings of august Rome, and on the plains of Macedonia—in this drama, the names of whose actors are like

the sound of trumpets and the voices of many waters—laughter is not wanting. We shall have occasion to note as we pass through it fragments of humour, touches of keen wit, happily blending with dark passions and supreme agonies, to form that strange mosaic which we call the life of man.

'Julius Cæsar' is classed with 'Hamlet' as a tragedy, which, like that of 'Hamlet,' gives us a picture of a good, and in the Roman play a great, nature breaking down under the burden of some great stress and strain. It is late in the day to point out that Brutus is the central figure of the play that bears the name of Cæsar. And as he is the central figure, so the central idea is the enormous contest, as of a struggle of Titans, that wages in his mind. He loves Cæsar. He loves Rome. And these two deep affections, deeper than all others, save that for Portia, his other self, are at enmity. For Cæsar is a danger to the Rome that Brutus wishes to be. Hence is he torn this way and that way by the passion of his love for the man, by the passion of his love for the country. Nor can that, his third deep emotion, his love for Portia, be his guide or strength in this immense contest. It may be for a comfort to him, but it does not enable him to decide as to how he shall act in the tremendous circumstances that environ him. Under the burden of such a struggle as this, in such a mind as his, even that mind breaks down. Murder does its evil work, and the Republic that he would have saved loses him, its noblest work, as it becomes an Empire.

One or two general remarks on the play ere we pass to the study of it from beginning to end. There be some that hold that our Shakespeare had it in mind to teach his countrymen political lessons in the 'Julius Cæsar.' These point us to the fact that the rebellion of Essex, which cost him his life in the ultimate issue, took place in the month of February, 1601, two years ere the death of the queen against whom he rebelled. They remind us that the play was produced not later than 1603. Therefore, to them the play is a lesson to the English people that they beware of political risings. So that Essex is Brutus and Elizabeth is Cæsar, and the storm in a teacup that Essex strove to raise on his return from Ireland is the world-shaking strife of Republican and Imperial Rome. When we remember that Shakespeare makes almost no reference in all his many plays to the events of his own time, when we compare the Elizabethan event with the Roman, it is difficult to avoid the conclusion that some straining after coincidences is here evident. Besides, Shakespeare always teaches high moral lessons; and he would never, I think, have taught the English people that rebellion as rebellion is wrong. Rebellion won Magna Charta, did away with the infamous poll-tax, founded our Parliament, swept to the winds the idea of the divine right of kings, gave England a constitutional government, brought about the Reformation, produced the Declaration of Independence on the part of the United States, freed Italy. It is urged that the aim of the dramatist is to show that vengeance falls upon those who rebel 'without sufficient cause.' But to Brutus the cause *was* all-sufficient. For 'cause' we must read 'strength.' He failed, as many another has failed, not because his cause was not one of excellence, but because his power was insufficient. The times were against him. 'The stars in their courses fought' on the side of his foes. The same critics are, I think, more near the truth when they tell us that the central idea of the play is that of friendship. In all his greater dramas Shakespeare has much dealing with the love of man for man; and in this tragedy the high-souled love of Brutus for Cæsar, his love for Cassius and for all his fellow-countrymen—affections that are now and again in conflict, but are yet all comprised under the one noble name of friendship—these are the very heart of the play.

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Lessons in Latin.

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LESSON I.

Formation of Accusative Case.

1. Many rules of Latin grammar are the same as those of English and other grammars.

2. Any rule which is peculiar to the Latin language is said to be a Latin idiom.

3. At first we shall principally be concerned with nouns and verbs, but a few prepositions and conjunctions will soon be introduced.

4. In Latin, nouns change their form to express their connection with other words in the sentence, and these changed forms are called its cases (fallings away). Of these cases there are six in the singular and six in the plural.

5. At present we shall only have to do with two cases, viz., the Nominative, used for the subject of a sentence, and the Accusative, used for the object of an active verb.

6. The nominative case is the form we find in the vocabulary or dictionary.

7. The accusative case, singular, except neuter nouns, always ends in 'm.'

8. There are five ways of changing the form of nouns, distinguished by the last letter of their original form; but, for the present, we shall distinguish them by their nominatives.

9. If a noun ends in 'a,' and the root is the word without the 'a'—as mensa, root mens—the noun is said to belong to the 'A' or 1st declension, and the accusative case is formed by adding 'am' to the root, as nom., mensa; root, mens; acc., mensam.

10. Nouns ending in us, with roots of one less syllable than the nom., are said to be of the 'O' or 2nd decl., and form their acc. by adding to the root um, as nom., servus; root, serv; acc., servum.

11. There are some nouns ending in 'us,' which belong to the 'U' or 4th decl., but we will defer the consideration of these for the present; but, like 'O' nouns, they form their acc. in 'um.'

12. Nouns ending in 'es' are most of them of the 'I' or 3rd decl., and form their acc. by adding to their roots em. There are also some nouns ending in 'es' which belong to the 'E' or 5th decl., which also form their acc. by adding to their roots 'em.'

13. Nouns in other terminations, and those in the above terminations, whose roots are of the same number (or more) syllables as their nom., belong to the 'I' or 3rd decl., and form their acc. (as above) by adding 'em' to the roots, as nom., lapis; r., lapid; acc., lapidem. There are other nouns which we cannot classify until we have learnt another case.

14. *Note* 1. The accusative of all neuter nouns is the same as the nom., however different the root may be, as nom., iter; root, itiner; acc., iter—a journey.

15. Unlike the English language there are many things without life that are not of the neut. gen.; as collis, a hill, is masc., and ulmus, an elm (as well as all other trees), is fem.

16. The verb is that portion of the sentence which expresses the action or suffering of the subject, as in 'The fox ate the hen,' 'ate' is the verb, because it

expresses what the subject, 'the fox,' did. Or in 'The hen was eaten by the fox,' 'was eaten' is the verb, because it expresses what was suffered by the subject, 'the hen.'

17. In translating a sentence into Latin

(1) Find the verb.

(2) Ask yourself the question who? or what? to the verb.

The answer to this question will show you the subject, which must be put in the nom. case.

(3) Ask yourself the question whom? or what? to the verb and subject.

The answer will show you the object of the verb, and the word must be put into the acc. case.

18. Now here is a table which must be learnt by heart.

DECLENSIONS.

	1	2	3	4	5
Characteristic	a	o	i	u	e
Acc. Case	am	um	em	um	em

19. VOCABULARY 1.

n.g. *stands for neuter gender.*

English.	*Latin.*	*Root.*	*Derivative.*
orator	orator	orator	oratorical
city	urbs	urb	urbane
Cicero	Cicero	Ciceron	
Milo	Milo	Milon	
man	homo	homin	homicide
life	vita	vit	vital
wine	vinum, n.g.		vintage
money	pecunia	pecuni	impecuniosity
part	pars	part	particle
hand	manus	man	manufacture
fox	vulpes	vulp	vulpine
town	oppidum, n.g.		oppidan
province	provincia	provinci	provincial
work	opus, n.g.		operate
honey	mel, n.g.		mellifluous
hen	gallina	gallin	gallinaceous
house	domus	dom	domicile
slave-master	dominus	domin	domineer
king	rex	reg	regal
voice	vox	voc	vocal
tree	arbor	arbor	arbour
wolf	lupus	lup	
kid	haedus	haed	

20. EXERCISE 1.

Model Sentence.

'The wolf killed the kid.'

(1) The verb, expressing action, is 'killed.' (2) Who killed? Ans. The wolf. Therefore, wolf is the subject of the sentence, and must be put into the nom. case, which we find in the vocabulary is 'lupus.' (3) What did the fox eat? Ans. The kid. Therefore, 'kid' is the object of the verb 'killed,' and must be put into the acc. case. In the vocabulary we find 'haedus' to be the Lat. of 'kid,' and by section 10 we know haedus is either of the O or U decl., and that its acc. must end in 'um' or haedum. Hence, writing the English word for killed, the sentence becomes

Lupus killed haedum.

21. *Note* 2. There is no Latin for the article 'the.'

EXERCISE 1.

22. Other words than 'the' not to be translated are inserted between parentheses, as (his).

In this exercise insert the English word for the verb as in model sentence:—

1. The hen pecked the fox. 2. The king finished the work. 3. Cicero defended Milo. 4. The kid inhabits the city. 5. The tree stands. 6. The fox runs. 7. He loses (his) life. 8. The man raises (his) hand. 9. The king reigns. 10. The orator slew Cicero. 11. Money ruined the city. 12. A part ran away. 13. The work will benefit the town. 14. Wine ruined the province. 15. The man was plucking the hen. 16. The voice frightened the king. 17. Honey pleased the man. 18. The slave-master killed the hen. 19. The house fell down. (20) He defied the king.

LESSON II.

VERBS OF A FORM.

23. As no sentence can be formed without a verb, we must, as soon as possible, learn some parts of the verb.

24. In this lesson we shall only consider verbs whose favourite or characteristic vowel is A, and only learn three forms of them.

25. The English of the word 'arabat' is 'he or she was ploughing.' Now the last letter 't' means 'he' or 'she.' The two preceding letters 'ba' means 'was' (or in plural verbs, were), followed by -ing (not 'was' unfollowed by -ing, as 'he was come'), the 'a' is the characteristic vowel, and lastly the 'ar' or root means 'plough.' Similarly 'arabit' means 'he or she will plough,' in which 'bi' means 'will'; and lastly, 'arat,' where the 't' is not preceded by either 'ba' or 'bi,' implies that the action is taking place now. So we have,

Present tense	ar-a-t	He or she ploughs or is ploughing.
Imperfect ,,	ar-a-ba-t	,, ,, was ploughing.
Future ,,	ar-a-bi-t	,, ,, will plough.

26. FIRST CONCORD. A verb agrees with its subject in number and person.

27. *Note* 3. The real English of 'Servus arabat' is, 'The slave he was ploughing,' where in English we omit the 'he.'

28. VOCABULARY 2.

English.	*Latin.*	*Root.*	*Derivative.*
to plough	arare	ar	arable
song	carmen, *n.g.*		
to salute	salutare	salut	salutation
to adorn	ornare	orn	ornate
to accuse	accusare	accus	accusation
Christian	Christianus	Christian	Christianity
garden	hortus	hort	horticultural
soldier	miles	milit	military
girl	puella	puell	
to praise	laudare	laud	laudable
son	filius	fili	filial
to arm	armare	arm	armour
slave	servus	serv	servile
general	dux	duc	duke
to water	irrigare	irrig	irrigation
to love	amare	am	amatory
to fly	evolare	evol	volatile
mountain	mons	mont	mount
to sing	cantare	cant	canticle
to dance	saltare	salt	saltatory

EXERCISE 2.

29. Numbers in brackets after a word refer to the number of vocabulary where the word is translated. Thus, king (1) means that the Latin for king will be found in Voc. 1.

A.

1. Servus irrigabit hortum. 2. Dominus (1) filium amabat. 3. Servus dominum laudat. 4. Christianus carmen cantat. 5. Opus (1) ducem fatigabit. 6. Puella saltat. 7. Puella servum accusabat. 8. Servus hortum ornabit. 9. Dominus (1) hortum arabit. 10. Vulpes evolabit.

B.

1. The king (1) was flying. 2. The fox (1) will salute the wolf (1). 3. The slavemaster (1) accuses the Christian. 4. The slave was adorning the tree (1). 5. Money (1) will arm the town (1). 6. The girl is singing a song. 7. The general will praise the soldier. 8. The soldier loves (his) son. 9. The soldier was watering the garden. 10. The tree (1) will adorn the mountain.

LESSON III.

VERBS OF LONG E FORM.

THE VOCATIVE CASE AND AFFIX OF VERBS MEANING 'THOU.'

30. The vocative or calling case is the same as the nominative, except nouns in 'us' of the O or 2nd decl., which ends in 'e,' as Servus, root serv. Voc. case, Serve, O slave. Nouns in 'ius,' as filius, use the root fili as their voc. case.

31. *Note* 4. Every Roman citizen had his middle name ending in 'ius,' as Quintus Horatius Flaccus; voc., Quinte Horati Flacce.

32. Long E verbs form the 3rd singular, just as the A verbs do, writing E for A, as docēre, to teach, R. doc. Present, docet, he teaches; Imperfect, docebat, he was teaching; and Future docebit, he will teach.

33. If instead of 't' we find 's' at end of verbs, its translation in English is 'thou' instead of he, she, or it, as in 'aras,' thou art ploughing; docebas, thou wast teaching; laudabis, thou wilt praise.

34. VOCABULARY 3.

English.	*Latin.*	*Root.*	*Derivative.*
to teach	docere	doc	doctor
through	per. preposition, followed by or governing acc. case		
death	mors	mort	mortal
poet	poeta	poet	poetical
nephew	nepos	nepot	nepotism
farmer	agricola	agricol	agriculture
to walk	ambulare	ambul	amble
without-the-knowledge-of,	clam, prep. govern. acc. case.		
to see	videre	vid	vision
to sin	peccare	pecc	peccable
daughter	filia	fili	filial
not	non, an adverb		
uncle	patruus	patru	
to frighten	terrere	terr	terrify
sister	soror	soror	
to grieve over	lugere	lug	lugubrious
to fear	timere	tim	timid
lion	leo	leon	
crown	corona	coron	coronation
and	et, a conjunction		

EXERCISE 3.

A.

35. The commas, between which a vocative case, in Latin, is inserted, will assist the student to distinguish it from a nominative case. Words hyphened together are expressed by only one word in Latin, as without-the-knowledge-of.

1. Dominus (1) puellam (2) docet. 2. Servus (2), domine (1), arabat (2). 3. Agricola, videbis filiam. 4. Mors, poetam non terrebis. 5. Servus (1) mortem timet. 6. Serve (1), per urbem (1) ambulabas. 7. Fili (2), videbas puellam (2) clam dominum. 8. Servus (2) peccabat. 9. Filia peccabit clam agricolam. 10. Per hortum (2), fili (2), non ambulabis.

B.

1. The uncle sees (his) nephew. 2. You will frighten (your) sister, (my) son. 3. The poet teaches (his) daughter. 4. The girl (2) will grieve-over (her) hen. 5. The lion sees the wolf (1) without-the-knowledge-of the fox (1). 6. The fox (1) fears the wolf (1). 7. The girl (2) was seeing the crown. 8. O master (1), (your) slave (2) is walking through the garden (2). 9. O farmer, you will teach your son (2). 10. The poet frightens (his) son (2) and (his) daughter.

LESSON 4.

SHORT E AND LONG I VERBS.

36. The third person singular of short E verbs ought to be:—

Present—scribet, he writes.
Imperfect—scribebat, he was writing.
Future—scribebit, he will write.

But for scribet, present, we find scribit, and the 'bi' is omitted in future tense, so that scribebit is found scribet.

37. So with long I verbs:—

Present—audit, he hears.
Imperfect—audiebat, he was hearing.
Future—audiet, he will hear.

38. Now here is a scheme of verbs, as far as we have gone, which ought to be written out from memory every day:—

	1	2	3	4	*English.*
char. vowel.	a	ē	ĕ	i	
Pres.	at	et	it	it	is or does
Imp.	abat	ebat	ebat	iebat	was — -ing
Fut.	abit	ebit	et	iet	will

39. If you examine this scheme you will find three terminations in 'et,' namely, pres. of long E verbs, and future of short E and long I verbs. In a lesson or two we shall also find 'et' in A verbs.

40. The second person 'thou' in all cases is formed by changing 't' into 's,' as regis, thou rulest; audies, thou wilt hear.

41. *Note* 5. A question with 'not' in it always begins with 'nonne,' as Caius loves his son, Caius filium amat. Does not Caius love his son? Nonne Caius filium amat?

42. VOCABULARY 4.

English.	*Latin.*	*Root.*	*Derivative.*
to hear	audire	aud	audible
to bind	vincire	vinc	
to rule	regĕre	reg	regal
to write	scribĕre	scrib	scribble
to run	currĕre	curr	curricle
into	in, prep. governing acc.		
grape	uva	uv	
poem	poema	poemat, n. gen.	poem
not (in a question)	nonne, always first word.		
head	caput	capit, n. gen.	capital
to pluck	carpĕre	carp	
to neglect	negligĕre	neglig	negligent
to reign	regnare	regn	
queen	regina	regin	
to kill	occidĕre	occid	
field	arvum	arv, n. gen.	
letter	epistola	epistol	epistle
to hurt	laedĕre	laed	
to throw	jacĕre	jaci	injection
the earth	terra	terr	terrestrial

43. EXERCISE 4.

A.

1. Puella (2) vocem (1) audiet. 2. Uvam carpes. 3. Rex (1), curris in hortum (2). 4. Leo (3) vulpem (1) terrebit (3). 5. Caput vinciebas. 6. Filius (2) per (3) urbem (3) currebat. 7. Fili, (2) sororem (3) negligis. 8. Nonne servus (2) arabit (2). 9. Rex (1) regnabit. 10. Regina, occides filium (2) et filiam (3) clam (3) regem (1).

B.

1. O girl (2), you were running through (3) the garden (2). 2. The king (1) was killing the queen, and (her) son (2), and (her) daughter (3). 3. O farmer (3), you are ploughing (2) a field. 4. The king (1) was frightening (3) the fox (1). 5. Will you not run through (3) the city? 6. She was writing a letter. 7. Does he not neglect (his) son (2)? 3. The slave (2) will hurt (his) head. 9. O king (1), you will pluck a grape and (3) throw (it) into the garden (2). 10. The queen reigns, (her) slave (2) ploughs (2) the land.

LESSON 5.

GENITIVE CASE SINGULAR.

44. The genitive case in Latin in part corresponds to our possessive case. At present we must translate it by 'of,' or by the English possessive case, as domini of a slave-master, or slave-master's.

45. This genitive is called the Limiting Genitive, that is, when we say 'the son of Cæsar' we do not speak of all sons, but only the son of Cæsar; hence Cæsar limits son. N.B.—We shall have to discuss other genitives at a future time.

46. The old genitive ending was 'ius,' as found in some adjectives and all the pronouns, except the personal ones; but the forms as found in pure Latin are as follows:—

	1	2	3	4	5
Char. letter	a	o	i	u	e
Gen. case	ae	i	is	us	ei

47. Now you are in a position to write down four out of the six cases of the singular number.

48. *Note* 6. In future the gen. case will be inserted in the vocabularies instead of the root, as it both shows the root and to what declension it belongs.

49. VOCABULARY 5.

English.	*Latin.*		*Derivative.*
A field	ager	G. agri	agricultural
Mother	mater	G. matris	maternal
Father	pater	G. patris	paternal
Brother	frater	G. fratris	fraternal
To send	mittĕre	R. mitt	missive
To understand	intelligĕre	R. intellig	intellect
Man	homo	G. hominis	homicide
Milo	Milo	G. Milonis	
Money	pecunia	G. pecuniæ	impecuniosity
Mountain	mons	G. montis	
Truth	verum	G. veri, n.g.	veracity
Law	lex	G. legis	legal
To come	venire	R. ven	advent
River	flumen	G. fluminis	flue
To value	aestimare	R. aestim	estimation
To pluck	carpĕre	R. carp	
Schoolmaster	magister	G. magistri	magistrate
Friend	amicus	G. amici	amicable
Heart	cor	G. cordis	cordial
To delight	deleclare	R. delect	delectable

50. EXERCISE 5.

51. *Note* 7. The genitive case is generally placed before the noun it limits.

A.

1. Milonis mater currebat (4) in hortum (2). 2. Nonne (4) servi (2) pater laedebat (4) filiam (3)? 3. Domini (1) filia (3) per (3) agrum ambulabit (3). 4. Veri lex mortem (3) negliget (4). 5. Nonne (4) agricola (3) arvum (4) arabit (2)? 6. Veniet patruus (3). 7. In (4) flumen lupum (2) jaciet (4). 8. Christianus (2) pecuniam non (3) æstimabit. 9. Vinum (1) hominis (1) cor delectat. 10. Magister amici puerum (2) et puellam (2) docebit (3).

B.

1. The schoolmaster understands the girl (2). 2. Does not (4) the farmer (3) run (4) into (4) the field (4)? 3. The mother (5) will send (her) daughter (3) into (4) the mountain. 4. The father's slave (2) was ploughing (2) the field (4) of the farmer (3). 5. Was not (4) the queen's (4) mother (5) plucking the grape (4)? 6. (His) brother's son (2) will kill (4) the farmer's (3) daughter (3). 7. Will you not (4), (my) son (2), love (2) (your) master's (1) brother? 8. Was not (4) the nephew (3) writing (4) a letter (4)? 9. A Christian (2) will not (3) fear (3) death (3). 10. Wast thou not (4), mother, walking (3) through (3) the garden (2) without-the-knowledge-of (3) (your) son (2)?

LESSON 6.

PRES. AND IMPERFECT OF SUBJUNCTIVE.

52. When a verb makes an assertion or asks a question, it is in the indicative mood; but when a verb is in a dependent sentence, it is put into the subjunctive mood.

53. The terminations of 3rd persons are:—

	1	2	3	4	*English.*
Char. vowel	a	ĕ	ĕ	i	
Present	et	eat	at	iat	may or let
Imperfect	aret	eret	eret	iret	might

54. Here we find the 3rd 'et'—viz., the present subjunctive of A verbs. So, whenever we see the termination 'et,' we cannot translate it until we know to what class or conjugation it belongs.

55. *Note* 8. You will notice the imperfect sub. is the form we find in the vocabularies (the infinitive present), with 't' added to it, and this is true of even the most irregular verbs with an active form.

56. VOCABULARY 6.

English.	*Latin.*		*Derivative.*
That	ut		
To be wise	sapĕre	R. sapi	sapient
Wisdom	sapientia	G. sapientiae	
To eat	edĕre	R. edo	edible
To live	vivĕre	R. viv	vivid
But	sed, a conjunc.		
Soldier	miles	G. militis	military
Book	liber	G. libri	library
To read	legĕre	R. leg	legible
To learn	discĕre	R. disc	disciple
To punish	punire	R. pun	punch
Flower	flos	G. floris	floral
To shut	claudĕre	R. claud	include
Gate	porta	G. portae	porter
Horace	Horatius	G. Horatii	
To receive	recipĕre	R. recipi	receipt

57. EXERCISE 6.

A

58. *Note* 89. In examining termination 'aret,' be sure as to whether the 'ar' is part of the root or of the ending.

1. Puer (2) veniebat (5) ut epistolam (4) scriberet (4). 2. Nonne (4) curris (4) per (3) urbem (1) ut uvam (4) carpas (5)? 3. Pater (5) filium (2) docebit (3) ut sapiat. 4. Sapientia verum (5) docet (3). 5. Non (3) edit ut vivat, sed vivit ut edat. 6. Miles veniet (5) ut agrum (5) aret (2). 7. Nonne (4) vinum (1) puerum (2) et puellam (2) delectat (5). 8. Scribit (4) epistolam (4) ut mater (5) verum (5) audiat (4) 9. Librum legebat ut sapientiam disceret. 10. Nonne (4), mater (5), filium (2) amas (2)?

B.

1. He does not (3) live that he may eat, but eats that he may live. 2. Does not (4) the slave-master (1) punish (his) slave (2) that he may be wise? 3. The mother (5) praises (her) son (2), but the father (5) will not (3) praise (his) daughter (3). 4. Will you not (4) run (4) into (4) the garden (2) that you may pluck (5) a flower? 5. Let the slave (2) come (5) that he may shut the gate. 6. You are finishing (your) work (1), (my) son (2). 7. Wisdom praises (2) truth (5). 8. Horace's son (2) is ploughing (2) the land without-the-knowledge-of (3) (his) brother (5) and sister (3). 9. Will you not (4) neglect (4) the law (5)? 10. Horace was writing (4) a poem (4) that he might receive money (5).

LESSON 7.

THE AFFIX OF VERBS MEANING 'WE' OR 1ST PERSON PLURAL.

59. The affix 'mus' to verbs in active voice means we. So, as 'amat' means 'he loves,' 'amamus' means 'we love.' 'Audiat,' 'let him hear;' 'audiamus,' 'let us hear,' etc., etc.

60. Before doing this exercise write out a scheme of the 3rd persons singular of the five tenses you have learnt, viz., Pres., Imp., Fut., Indic., and Pres. and Imp. Sub., and from these twenty terminations you can at once form forty more, viz., by changing the 't' into 's' for 'thou,' and into 'mus' for 'we.'

61. VOCABULARY 7.

English.	*Latin.*		*Derivative.*
Town	oppidum	G. oppidi	oppidan
Harvest	messis	G. messis	
To produce	ferre	R. fer	fertile
Disciple	discipulus	G. discipuli	
City	urbs	G. urbis	urbane
Because	quia, a conjunct.		
To delight	delectare	R. delect	delectable
To have	habēre	R. hab	habit
Son	filius	G. filii	filial
Slave	servus	G. servi	servile
Daughter	filia	G. filiae	
Letter	epistola	G. epistolæ	epistle
Grape	uva	G. uvae	
Boy	puer	G. pueri	puerile
Field	arvum, n.g.	G. arvi	
Farmer	agricola	G. agricolæ	agriculture
Wine	vinum	G. vini	vintage
Poet	poeta	G. poetae	poetical
Voice	vox	G. vocis	vocal
Water	aqua	G. aquæ	aqueous.

62. EXERCISE 7.

63. *Note* 10. The pres sub. without an 'ut' must be translated by 'let,' as 'amet,' 'let him love.'

1. Venimus (5) ut (6) uvam carpamus (5). 2. Nonne (4) scribes (4) epistolam (4) ut (6) mater (5) audiat (4). 3. Legamus (6) librum (6) ut (6) discamus (6). 4. Intelligimus (5) filium et (3) filiam. 5. Docemus (3) puerum. 6. Aremus (2) arvum ut (6) messem ferat. 7. Fili, amas (2) patrem (5) et matrem (5) sed (6) non (4) amas (2) fratrem (5). 8. Nonne (4) arat (2) arvum ut (6) servum doceat (3). 9. Magister (5) discipulum docet (3) ut (6) sapiat (6). 10. Claudat (6) portam (6) oppidi.

64. B.

1. Let him plough (2) the field (5) that (6) it may produce a harvest. 2. We are coming (5) that (6) we may shut (6) the gate (6) of the city. 3. Is not (4) the farmer ploughing (2) the field (5) that (6) he may teach (3) (his) slave? 4. He loves (2) (his) mother (5) because she loves (2) (her) daughter (3). 5. Does not (4) wine delight the poet? 6. Do not (4) we understand (5) the voice? 7. She was walking (3) through (3) the city. 8. Shall we not (4) throw (4) the boy into (4) the water? 9. Wisdom (6) will teach (3) the man (5). 10. Let us pluck (5) a grape that (6) we may have wine.

LESSON 8.

THE ACCUSATIVE PLURAL.

65. The accusative plural of masc. and fem. nouns is formed by adding to the root the letter s preceded by the characteristic letter, with the exception of 'I' declen., in which it is written generally 'es.' Thus:—

	1	2	3	4	5
Char. vowel	a	o	i	u	e
Acc. pl.	as	os	es	us	es.

The accusative plural of all neuter nouns ends in a.

66. Now we know five out of the twelve cases found in the nouns.

67. VOCABULARY 8.

English.	*Latin.*		*Derivative.*
behind	pone, preposition governing acc. case.		
day	dies	G. diei	diurnal
death	mors	G. mortis	mortal,
earth	terra	G. terrae	terrestrial
fox	vulpes	G. vulpis	vulpine
nephew	nepos	G. nepotis	nepotism
orator	orator	G. oratoris	oratorical
girl	puella	G. puellae	
under	sub, a preposition governing acc. case.		
wool	lana	lanae	
part	pars	partis	partial
letter (of alphabet)	litera	literæ	literal
hand	manus	G. manūs	manufacture
wolf	lupus	G. lupi	
sheep	ovis	G. ovis	
sister	soror	G. sororis	
citizen	civis	G. civis	civil
table	mensa	G. mensae	
to destroy	perdēre	R. perd	perdition
poem	poema, n.g.	G. poematis	
garden	hortus	G. horti	horticultural
dog	canis	G. canis	canine
to ask	rogare	R. rog	rogation
to dip	mergĕre	R. merg	immerse
king	rex	G. regis	regal
queen	regina	G. reginæ	
to raise	comparare	R. compar	

EXERCISE 8.

A.

68. 1. Magister (5) pueros (7) docet (3). 2. Homo (5) filios (7) et filias (7) amat (2). 3. Venit (5) ut (6) puellas ornet (2). 4. Puer (7), non (3) discis (6). 5. Nonne (4) lupus oves (8) occidet (4). 6. Veniat (5) ut (6) urbis (7) portam (6) claudat (6). 7. Sororem non (3) laedet (4) quia (7) patrem (5) amat (3). 8. Pecunia (5) cives delectat (7). 9. Vinum (7) homines (5) perdit. 10. Nonne (4) poeta (7) poema scribet (4).

B.

1. Let us walk (3) through (3) the gardens without-the-knowledge-of (3) (our) fathers (5). 2. The boy (7) will throw (5) the dog into (4) the river (5) because (7) it was hurting (4) (his) sisters. 3. We will ask (our) mothers (5) that (6) we may run (4) through (3) the gardens. 4. He was dipping (his) hands into (4) the water (7). 5. She will run (4) under the tables because (7) she fears the dogs, but (6) (her) brother (5) will walk (3) through (3) the door (gate) (6). 6. The boy (7) understands (5) the letters (of the alphabet) and (3) will write (4) (them). 7. He was carding (plucking) (4) (his) part of the wool. 8. He will water (2) the fields (7). 9. Thou, O boy (7), art praising (2) the kings and (3) queens. 10. Let us eat (6) that (6) we may live (6).

69. EXAMINATION QUESTIONS. NO. 1.

Define, Subject, Object. How are they found? What is the principal use of acc. case? Show the connection between the words 'case' and 'declension.' What is the old termination of gen. case? Where is it still found? What is a preposition? What do you mean by saying a preposition governs a case? When is a verb in the indicative mood, and when in subjunctive? What are the distinguishing letters respectively of the acc. sing. and acc. plural? How is 'not' translated in interrogative sentences? Show the exact meaning of every part of 'compararemus' (8).

(To be continued.)

—o—

ANSWERS TO ARITHMETICAL QUESTIONS IN 'THE LITTLE LEARNER,' FOR MARCH, 1883.

STANDARD I.

A. (1) 188
(2) 96
(3) 289

B. (1) 759
(2) 875
(3) 2,148

C. (1) 994
(2) 1,059
(3) 3,269

D. (1) 405
(2) 133
(3) 537

E. (1) 83
(2) 208
(3) 446

F. (1) 237
(2) 293
(3) 439

G. (1) 6,099
(2) 13,503
(3) 24,402

H. (1) 619
(2) 5,368
(3) 4,978

I. (1) 20,281,236
(2) 18
(3) 73 nuts

J. (1) Six hundred & three
(2) 54,304,836
(3) 810 passengers

STANDARD II.

A. (1) 71,917
(2) 135,842
(3) 361,402

B. (1) 13,537
(2) 286
(3) 87,877

C. (1) 531,603
(2) 342,588
(3) 5,625,440

D. (1) 2,947,896
(2) 5,329,842
(3) 66,782,160

E. (1) 15,285,900
(2) 53,031,000
(3) 706,921,411

F. (1) 5,497
(2) 9,021+4
(3) 8,769

G. (1) 11,315+6
(2) 7,733+6
(3) 3,999

H. (1) 8,714+46
(2) 6,245
(3) 5,491+43

I. 1) 5s. 8d.; 6s. 11d.; 10s. 10d.
(2) 497,458
(3) 4,784 feet

J. (1) 146,880 words
(2) 4s. 9d.; 6s. 4d.; 11s. 11d.
(3) 6,663 eggs

STANDARD III.

A. (1) 1,469
(2) 2,075
(3) 713+11

B. (1) 7,306
(2) 11,623+25
(3) 9,650

C. (1) 10,594+233
(2) 4,607
(3) 7,960

D. (1) 353+1,919
(2) 5,008
(3) 9,378

E. (1) £36 3s. 3d.
(2) £178 19s. 5½d.
(3) £1,283 19s. 10½d.

F. (1) £7,799 18s. 10½d
(2) £14,919 16s. 2d.
(3) £88,755 1s. 11½d.

G. (1) £31 14s. 10d.
(2) £794 16s. 6½d.
(3) £166 19s. 8½d.

H. (1) £88 15s. 8½d.
(2) £2,854 14s. 10¾d.
(3) £54,054 10s. 10¾d.

I. (1) 54,280 days
(2) 909 children
(3) £35 12s. 3d.

J. (1) 17,800 minutes
(2) £2 16s. 10d.
(3) 50 pounds

ANSWERS TO ARITHMETICAL QUESTIONS IN 'THE SCHOLAR,' FOR MARCH, 1883.

STANDARD IV.

A. 1. £5527 13s. 2¾d.
2. £214 17s. 1¾d.—21.
3. 16,225,200 sec.

B. 1. 2154 cwt. 3 qr. 9 lb. 7 oz. 11 drs.
2. £9 12s. 8½d.—210
3. 4,352,040 inches.

C. 1. 87,480 sq. inches.
2. £10,669 1s. 11½d.
3. 2s. 3¾d.—6765.

D. 1. £12 1s. 1½d.
2. 64 ton 2 cwt. 1 qr. 8 lb.—9.
3. 132 c. yd. 11 ft. 749 in.

E. 1. £83,625 9s. 4½d.
2. £75 18s. 9d.
3. 13,344,060 sec.

F. 1. 95 times.
2. £5 4s. 2d. gain.
3. 43 ton 2 qr. 18 lb.

ADVANCED EXAMINATION.

1. £274 1s.
2. £294 18s. 9d.
3. 2¼d.

STANDARD V.

A. 1. £133 16s. 0⅓d.
2. 2116 11s. 7½d.
3. £322 6s.

B. 1. £2782 10s.
2. £9 19s. 11½d.
3. £10 14s. 2⅝d.

C. 1. £3608 7s. 11d.
2. 14 cwt. 32 lb.
3. £4 0s. 7$\frac{8}{13}$d.

D. 1. £8794 10s.
2. 8$\frac{4}{5}$.
3. £119 8s. 9d.

E. 1. £4343 15s.
2. £8041 0s. 1¾d.
3. £38 9s. 8d.

F. 1. £546 0s. 7d.
2. £3,545,556 15s. 4½d.
3. 10½ hours.

ADVANCED EXAMINATION.

1. £90 1s. 5$\frac{8}{9}$d.
2. £272 5s.
3. 4$\frac{8}{9}$.

STANDARD VI.

A. 1. $3\frac{7}{12}$.
2. $1\frac{5}{8}$.
3. $86\frac{1}{4}\frac{1}{4}$.

B. 1. 462 feet.
2. 24,510.
3. $\frac{9}{3\,4}$.

C. 1. $35\frac{1}{2}$ miles.
2. £9 12s.
3. 450.

D. 1. £6 1s. 9½d.
2. $\frac{1}{1\,1}$.
3. $12\frac{1}{8}$.

E. 1. 9s. 2d.
2. $1\frac{1\,0\,7}{2\,5\,0}$.
3. $1\frac{7}{1\,6}$.

F. 1. ·005059+.
2. ·00429.
3. $\frac{8\,8\,8}{1\,0\,0\,0}$ cwt.

ADVANCED EXAMINATION.

1. 4 to 1.
2. $1\frac{1}{2}$ oz.
3. £19 3s. $3\frac{1\,1}{1\,1\,1}$d.

STANDARD VII.

A. 1. £19 8s.
2. £1 1s. $3\frac{9}{1\,6}$d.
3. 7s. $6\frac{3}{4}\frac{7}{6}$d.

B. 1. £118 2s. 10½d.
2. £485 8s. 2·94d.
3. $33\frac{1}{3}$ per cent.

C. 1. £1 19s. $4\frac{1}{4}\frac{1}{6}$d.
2. £2 7s. $5\frac{3}{8}\frac{3}{4}$d.
3. £532.

D. 1. £70 11s. 10·26375d.
2. £3 5s. $10\frac{1}{2}\frac{1}{4}$d.
3. $3\frac{1}{3}$ per cent.

E. 1. $4\frac{9}{1\,1}$ per cent.
2. £879 15s. 7½d.
3. £333 6s. 8d.

F. 1. $242,062\frac{1\,7}{2\,5}$ av.
2. £769 17s. $6\frac{3\,7\,0}{1\,4\,4\,0}$d.
3. 2 yr. 11 months.

ADVANCED EXAMINATION.

1. 18·2045+ per cent.
2. £8638 7s. $6\frac{7\,3\,0}{1\,0\,0\,0}$d.
3. 8 and 10 respectively.

SOLUTIONS OF THE ADVANCED EXAMINATION QUESTIONS IN 'THE SCHOLAR' FOR MARCH, 1883.

STANDARD IV.

1. $2\frac{1}{2}$ lb. × 336 × 56 = 42,336 lb.
42,336 lb. ÷ 112 = 378 cwt., which at 14s. 6d.
= £274 1s. Ans.

2. 4840 × 30 = 145,200 sq. yds., which divided by 60 = 2420 pints of seed sown. Then 2420 × 24 = 58,080 pints = 7260 gals. = 907½ bushels produce, which at 6s. 6d.
= £294 18s. 9d. Ans.

3. £4860 ÷ 6 = £810 a day = (÷ 24) £33 15s. an hour = (÷ 60) 11s. 3d. a min. = (÷ 60) 2¼d. a sec. Ans.

STANDARD V.

1. £10 8s. 6½d. + £47 6s. 8½d. + £11 3s. 5½d. + £20 16s. 8d. + 6s. 1½d. = £90 1s. 5½d. Ans.

2. 4840 × 16 = 77,440 sq. yds., × $\frac{3}{8}$ = 58,080 pints = 907½ bushels, which at 6s. a *bushel* = £272 5s. Ans.

3. The least common denominator is 120, then bringing each of the fractions to 120ths we have:

$$\frac{3}{4} + \frac{5}{6} + \frac{7}{8} + \frac{3}{5} + \frac{4}{3} + \frac{7}{1\,0} =$$

$$\frac{90+100+105+80+96+84}{120} = \frac{5\,5\,5}{1\,2\,0} = 4\frac{7\,5}{1\,2\,0} = 4\frac{5}{8}. \quad \text{Ans.}$$

STANDARD VI.

1. £20 ÷ (15 × 8 = 120) = 3s. 4d. a man's daily wage.
£5 ÷ (12 × 10 = 120) = 10d. a boy's ,,
Hence the ratio is 4 to 1. Ans.

2. 4 ÷ 3 = 1⅓ oz. eaten the 1st day; 4 − 1⅓ = 2⅔ oz. left on the 1st day. ⅓ of ⅔ = ⅔ oz. eaten on the 2nd day; 2⅔ − ⅔ = 1⅔ oz. left on the 2nd day. ⅓ of $\frac{1\,0}{3}$ = $\frac{1\,0}{9}$ eaten on the 3rd day.
Then $1\frac{2}{3} - \frac{1\,0}{9} = 1\frac{5}{9}$ ozs. Ans.

3. From April 14th (exclusive) to December 31st is 261 days; and 4 per cent. is $\frac{1}{2\,5}$.
Then £$\frac{3\,7\,0}{1\,0\,0}$ × $\frac{2\,6\,1}{2\,5}$ = £19 3s. $3\frac{1\,1}{1\,1\,1}$d. Ans.

STANDARD VII.

1. £90,878 − £13,996 = £76,882 receipts in 1881. Hence the increase per cent. is £13,996 ÷ £768·82 (the No. of hundreds)
= 18·2045+ per cent. Ans.

2. £1 would amount to £1·157625 in the 3 years, hence £10,000 ÷ £1·157625 = £8638 7s. 6d. $\frac{7\,5\,0}{1\,0\,0\,0}$. Ans.

3. (0 × 15 = 0) + (1 × 8 = 8) + (2 × 7 = 14) + (3 × 3 = 9) + (4 × 2 = 8) + (5 × 3 = 15) = a total of 54 mistakes made by 38 scholars. Again, 1·8 × 40 = 72 total mistakes among the 40 scholars. Hence 72 − 54 = 18 mistakes made by the remaining two scholars, and as one makes two more than the other, they make 8 and 10 respectively. Ans.

Certificate Examination, 1882.

MALE AND FEMALE CANDIDATES.

FIRST YEAR.

Grammar and Composition.

(*Continued from p.* 616, *vol.* ii.)

Composition.

3. The nineteenth century will be noted, among other things, for the great developments made in the use of electricity. Formerly it was contended that chemical action was the true source of electricity, but now the chief source of power for many purposes is found in the use of frictional machines for its production. The inventions of Edison, Swan, Gramme, and Siemen, have done much to make the production of light by electricity possible, and even practicable not only on account of its brilliancy, but also on account of its cheapness. Two principal kinds of light have been brought into use, one known as the arc light, and the other as the incandescent light.

When two pencils of charcoal form the electrodes the passage of the current soon raises them to a white heat, and a most brilliant light is the result. The difficulty of keeping the points of the carbon always at the same distance has been overcome, and the result is that streets of cities, large works, halls, and public buildings, are now illuminated by these means.

Acting upon the knowledge that wire terminals exhibit the most vivid combustion, both Mr. Edison and Mr. Swan have invented lamps on the incandescent principle. The lamps so invented exhibit a small glass globe, in which, in a vacuum, curved wire or other substance connected with the machine is inserted. This becomes luminous on the starting of the machine, and a soft pleasant light, almost without heat, and entirely without the injurious products arising from the consumption of coal gas, is the result. This light is now extensively used in theatres, private houses, and on board ships. Other uses of electricity have also lately been discovered.

4. In this age of railways and telegraphs, of buying and selling, of work and wages, there is a tendency to imagine that houses, and lands, and wealth alone give pleasure, and that thought and imagination and all the other powers of the mind are useless for this purpose. Such a tendency should be struggled against, for man has higher aims, nobler purposes to serve, than to eat, and drink, and die. All the great men of the earth—those whom nations speak of as truly great—have been those whose occupations have consisted in the cultivation of the intellectual faculties, and whose enjoyments have been the delights which follow such a pursuit. Such pleasures are the natural sequence of a love of books. Herschel somewhere says, that if he were under the necessity of having to ask for a taste which should be his stay under all circumstances, a source of happiness through life, and a shield against all its ills, it would be a taste for reading. Given such a taste, and the power to gratify it, a man may be independent of all outward things. He is placed in communion with all the noblest minds and the brightest thoughts which have ever conferred blessings on the world. Every poet, every historian, every man of science, becomes his companion, and the whole world of knowledge lies at his feet. With these conversing he forgets all time, all toil and care, and the pursuit of such pleasures more than compensates for the loss of mere animal enjoyments.

Grammar.

SECTION A.

But lo! the dome, the vast the wondrous dome,
To which Diana's marvel was a cell—
Christ's mighty *shrine* above His martyr's tomb!
I have beheld the Ephesian's miracle—
Its columns strew the wilderness, and *dwell*
The hyæna and the jackal in their shade:
I have beheld *Sophia's* bright roofs *swell*
Their glittering mass i' the sun, and have surveyed
Its sanctuary *the while* the usurping Moslem prayed;

But thou of temples old, or temples new
Standest alone,—with nothing like to thee,—
Worthiest of God, the holy and the true.
Since Zion's desolation, when *that* He
Forsook His former city, what *could* be
Of earthly structures in His honour *piled*
Of a *sublimer* aspect? Majesty,
Power, Glory, Strength and Beauty, all are aisled
In this eternal ark of worship undefiled.

1. Parse the words in italics in the above.

2. Break up the whole passage into its component sentences, and give a particular analysis of the last stanza.

3. Explain the allusions.

1. *To*—Prep. showing relation between 'cell' and 'which.'
shrine—Com. noun, neut. gen., sing. no., objective case, in apposition with 'dome.'
dwell—Irr. int. verb, act. voice, ind. mood, pres. tense, 3rd plural, agreeing with its noms. 'jackal' and 'hyæna.'
Sophia's—Prop. noun, neut. gen., sing. no., 3rd per., poss. case, gov. by 'roofs.'
swell—Reg. trans. verb, inf. mood, pres. tense, gov. by 'have beheld.'
the—adj. of distinction, limiting 'while.'
while—Adv. used as a noun, neuter gen., sing. no., obj. case, gov. by 'during,' und.
worthiest—Adj. of quality, superlative degree, qual. 'temple.'
since—Prep., showing relation between 'desolation' and 'piled.'
that—Cop. conj., joining the sentences 'when *it happened*' and 'He forsook.'
could—Aux. of potential mood to 'be piled,' past tense.
piled—Past part. of the verb 'to pile,' referring to 'what.'
sublimer—Adj. of quality, comp. degree, qualifying 'aspect.'

2. (*a*) But lo! the dome, the vast the wondrous dome—Christ's mighty shrine above His martyr's tomb!

(*a*) To which Diana's marvel was a cell. '
(*b*) I have beheld the Ephesian's miracle—
(*c*) Its columns strew the wilderness,
(*d*) And the hyæna and the jackal dwell in their shade.
(*e*) I have beheld Sophia's bright roofs swell their glittering mass i' the sun,
(*f*) And have surveyed its sanctuary
(*g*) The while the usurping Moslem prayed.
(*h*) But thou, of temples old, or altars new, standest alone, with nothing like to thee the worthiest of God, the holy and the true.
(*i*) Since Zion's desolation what could be, of earthly structures, piled of a sublimer aspect,
(*j*) When (it happened)
(*k*) That He forsook His former city?
(*l*) Majesty, Power, Glory, Strength and Beauty, all are aisled in this eternal ark of worship undefiled.

The division marked (*a*) above may be treated as Nominative of Exclamation, or as an Elliptical Sentence.

	Kind of Sentence.	Relation to Prin. Sent.	Connective.	Subject.	Enlargement of Subject.	Predicate.	Extension of Pred.	Object.	Enlargement of Object.
1.	Principal		But	Thou	of temples old or altars new alone worthiest of God, the holy and the true, with nothing like to thee	standest			
2.	Principal (interrogative)			What	of a sublimer aspect of earthly structures	could be piled	in His honour (Manner) since Zion's desolation (Time).		
3.	Subordinate	Adverbial of Time to 'desolation.'	When	[it]		[happened]			
4.	Subordinate	Noun sent. in app. with 'it' in 3.	That	He		forsook		city	His former.
5	Principal.			Majesty, Power, Glory, Strength, and Beauty.	all	are aisled	in this eternal ark of worship, undefiled (Place).		

3. *Diana's marvel*—The temple of Diana at Ephesus, noted for its size and beauty. Spoken of as one of the seven wonders of the world.

Christ's mighty shrine—The church of St. Peter at Rome.

Martyr's tomb—The apostle Peter is by some supposed to have been martyred at Rome.

Ephesian's miracle—The temple of Diana.

Sophia's bright roofs—The covering of the Mohammedan mosques at Constantinople.

The usurping Moslem—Constantinople, long famous for learning and science, was conquered by Mahomet II. in 1453.

Zion's desolation—The destruction of the temple at Jerusalem in 70 A.D.

SECTION B.

Thou seest not all: but piecemeal thou *must* break
To separate contemplation, the great *whole;*
And, as the Ocean many bays will make,
That *ask* the eye,—so here condense thy soul
To more immediate objects, and *control*
Thy thoughts *until* thy mind hath got by heart
Its eloquent proportions, and *unroll*
In mighty graduations part by part
The *glory* which at once upon thee *did* not *dart,*

Not by its fault, but *thine:* our outward sense
Is *but* of gradual grasp,—and, *as it is*
That what we have of feeling most *intense*
Outstrips our faint expression, e'en so this
Outshining and o'erwhelming edifice
Fools our fond gaze, and greatest of the great
Defies at first *our* Nature's littleness,
Till *growing* with its growth we thus dilate
Our spirits to the size of *that* they contemplate.

1. Parse the words in italics in the above.

2. Break up the whole passage into its component sentences, and give a particular analysis of the first stanza.

3. Explain the following words, with reference to their etymology:—*piecemeal—condense—eloquent—graduation—separate—intense—expression—immediate—overwhelming—dilate—objects—fond—edifice—contemplation—spirits.*

1. *must*—Aux. verb to 'break,' indicating potl. mood, present tense.
whole—Adj. used as noun, neuter, sing., 3rd obj., governed by 'must break.'
ask—Reg. trans. verb, active, ind., pres., 3rd, sing., agreeing with 'that.'
control—Reg. trans. verb, active, imp., 2nd, sing., ag. with 'thou,' understood.
until—Adverbial cop. conj., joining the sentences, 'Thou control thy soul' and 'Thy mind hath got by heart,' indicating conditional mood.
unroll—Reg. trans. verb, active voice, conditional, sing., 3rd, agreeing with its nom. 'it,' understood.
glory—Abs. noun, neuter, sing., 3rd, obj., gov. by 'unroll.'
did—Aux. verb. to 'dart,' indicating past tense, and marking emphatic form.
dart—Reg. intrans. verb, act., inf., pres., gov. by 'did.'
did dart—Reg. intrans. verb, act., ind., past, 3rd, sing., emphatic form, agreeing with its nom. 'which.'
thine—Pers. pro., com., sing., 2nd, poss., gov. by 'fault,' understood.

Or, poss. pro., sing., obj., gov. by 'by.'

but—Adv. of deg., qualifying 'is.'
as—Disj. conj., introducing the sent. 'it is.'
it—Personal pro., neut., sing., 3rd, nom. to 'is,' cor-rel. to 'so.'
is—Irreg. int. verb, act., ind., pres., sing., 3rd, agreeing with 'it.'
that—Cop. conj., joining the sentences, 'it is' and 'what outstrips.'
intense—Adj. of quality, super. deg., qualifying 'feeling.'
outstrips—Irr. trans. verb, act., ind., pres., 3rd, sing., agreeing with its nom. 'which,' included in the word 'what.'
our—Per. pro., com., plural, 1st, poss., gov. by 'Nature.'
growing—Pres. participle of the intrans. verb 'to grow,' referring to 'we.'
that—Rel. pro., ref. to 'edifice,' neuter, sing., 3rd, obj., gov. by 'of.'

Or, distinguishing adj., qual. 'edifice,' understood.

2. (*a*) Thou seest not all.
(*b*) But piecemeal thou must break to separate contemplation, the great whole.
(*c*) And so here condense thy soul to more immediate objects.
(*d*) As the Ocean many bays will make.
(*e*) That ask the eye.
(*f*) And control thy thoughts.
(*g*) Until thy mind hath got by heart its eloquent proportions.
(*h*) And unroll in mighty graduations, part by part, the glory.
(*i*) Which at once upon thee did not dart, not by its fault.
(*j*) But thine.
(*k*) Our outward sense is but of gradual grasp.
(*l*) And even so this outshining and o'erwhelming edifice, fools our fond gaze.
(*m*) As it is.
(*n*) That what of feeling most intense outstrips our faint expression.
(*o*) We have.
(*p*) And greatest of the great defies at first our Nature's littleness.
(*q*) Till growing with its growth we thus dilate our spirits to the size of that.
(*r*) They contemplate.

Kind of Sent.	Relation to Prin. Sent.	Connective.	Subject.	Enlargement of Subject.	Predicate.	Extension of Predicate.	Object.	Enlargement of Object.
(*a*) Principal			Thou		seest	not (negative)	all	
(*b*) Principal	Adversative to *a*	But	thou		must break	piecemeal (Manner)	whole (dir.) to contemplation (indir.)	the great separate
(*c*) Principal	Co-ordinate to *b* Adversative to *a*	and	[thou]		[must] condense	so (Manner) here (Place)	soul (dir.) to objects (indir.)	thy more immediate
(*d*) Subordinate	Adverbial to *c*	as	Ocean	the	will make		bays	many
(*e*) Subordinate	Adjective to 'bays' in *d*	(In rel. pro.) that			ask		eye	the
(*f*) Principal	Co-ordinate to *b* and Adversative to *a*	and	[thou]		[must] control		thoughts	thy
(*g*) Subordinate	Adverbial to *f*	until	mind	thy	hath got	by heart (Manner)	proportions	its eloquent
(*h*) Subordinate	Adverbial to *f*, Co-ordinate to *g*	and [until]	it		unroll	part by part in mighty gradu ations (Manner)	glory	the
(*i*) Subordinate	Adjective to 'glory' in *h*	(In rel. pro.) which			did dart	not, not by its fault (Manner) at once (Time) upon thee (Place)		

3. *Piecemeal*—In portions, bit by bit; *piece* probably coming from Italian *pezza*, a piece, or Greek *peza*, through the Italian, a bit.
Meal from A.S. *melewe*, to grind.
condense—From Latin *con*, together, and *denso*, to make dense, meaning therefore to compress; to reduce into smaller compass; to concentrate.
eloquent—Having the power to speak clearly and forcibly; from Lat. *eloquens*, verb *eloquor*, to speak.
graduation—From Lat. *gradus*, a step; going by degrees; a little at a time.
separate—From Lat. *se*, apart, and *paro*, to put or place; set aside away from every other.
intense—From Lat. *in*, in or towards, and *tendo*, to stretch; stretched or strained; increased to a high degree.
expression—Lat. *ex*, out, and *presso*, to squeeze; that which is pressed out.
immediate—Lat. *im*, not, and *media*, the middle; having nothing intervening or coming between.
overwhelming—*Over*, from A.S. *ofer*, through German *über*, from Sans. *upari*, meaning over; *whelming*, from A.S. *welman*, to plunge deep; to cover completely; that which is covered over, crushed by something heavier than itself.
dilate—From Lat. *di*, *dis*, apart, and *fero*, *latum*, to bear or carry; spread out in all directions; told at great length.
objects—From Lat. *ob*, in the way of, and *jacio*, to throw; things placed so as to be observed; in view.
fond—Probably from Lat. *vanus*, empty, foolish. In O.E.

there was *fonne*, being excessively loving or tender; foolish.

edifice—From Lat. *ædes*, a house, and *facio*, to make; a building.

contemplation—From *con*, together, and so complete, and *templum*, a place cut off. In augury a place was set apart for thought or consideration; the act of studying or thinking earnestly is a contemplation.

spirits—From Lat. *spiro*, to breathe; mental activities.

Grammar.

1. Give a few examples—if possible, from the portion of 'Childe Harold' which you have been studying—of words derived from (*a*) Latin, (*b*) Greek, (*c*) Anglo-Saxon, and (*d*) other sources, respectively; and, when necessary, explain how they came into the form in which we now find them used.

(*a*) *From the Latin*—Subject, enchanters, expand, nations, despond, arch, immortal, constellations, form, resume, sanctuary, annual, submission, redemption, intent, reclaim, sufficient.

All the above words are derived directly from the Latin, and have undergone little alteration, affixes or terminations only being different.

(*b*) *From the Greek*—Melancholy, phantoms (with an English suffix), maniac, demons (English form of plural), epitaph, sympathy (Lat. has *pathos*, Greek, *epathon*; *y*, however, is a Greek suffix), monarch, sarcophagus.

(*c*) *From the Anglo-Saxon*—Day (daeg softened), bespeak, wax, ere, went, holiday, eye, may (magan softened), good, dwell, yon (geond softened).

(*d*) *From other languages*—Magical, from Persian; bard, from Welsh; barque, from French; mother, from Old English.

2. State the general rules (*a*) for forming the plurals of nouns, (*b*) comparative and superlative forms of adjectives, (*c*) the perfect tenses and past participles of verbs, and give examples of irregularities in each process.

(*a*) Nouns form their plural by adding *s* to the singular, as *boy, boys; house, houses.* To this rule there are many exceptions:—

(1) Nouns ending in *s, ss, sh, ch* (soft), *x*, and *z*, form their plural by adding *es*, as *brush, brushes.*

(2) Some nouns in *o*, especially if preceded by a consonant, add *es*, as *cargo, cargoes.* Many, however, take only *s*, as *bravo, bravos.*

(3) Nouns in *f* or *fe* change into *ves* for the plural, as *knife, knives.* To this also there are exceptions, as *gulf, gulfs; strife, strifes.*

(4) Nouns ending in *y*, preceded by a consonant, form their plural by changing *y* into *ies*, as *lady, ladies.* Preceded by a vowel, *s* is added as *day, days; chimney, chimneys.*

(5) Some nouns change the vowel of the word, as *man, men.*

(6) Three nouns have *en* in the plural.

(7) Some have singular and plural alike, as *deer, sheep.*

(8) Some have no singular, as *annals*, and some have no plurals, as *wool, milk.*

(9) Foreign words retain their own plurals, as *axis, axes; focus, foci.*

(*b*) The comparative and superlative of adjectives are formed by adding *er* and *est* respectively to the positive, as, *strong, stronger, strongest.* If the positive ends in *e*, then *r* and *st* only are added.

If the positive consists of two or more syllables, then *more* and *most* are prefixed to the positive for the comparative and superlative, as *beautiful, more beautiful, most beautiful.*

Some adjectives, because of their absolute signification, do not admit of comparison, as *dead, empty, impossible*, etc.

Some adjectives have irregular comparisons, as *good, better, best.*

(*c*) The perfect tense of a verb is formed by prefixing the auxiliary *have* to the past participle of the verb, as present, *love*; perfect, *have loved.*

The past participle of regular verbs is formed by adding *d* or *ed* to the present tense, as *love, loved; fear, feared.*

Irregular verbs form their past participles in different ways. The most common endings are *n, en*, and *t*, as, *throw, thrown; tread, trodden; weep, wept.*

3. Explain the etymology of the terms *adjective, preposition, adverb, pronoun, interjection, participle*; and show the appropriateness of those names for the different parts of speech indicated.

Adjective—From Lat. *ad*, to, and *jacio*, I throw or cast, meaning something added, cast or thrown to, describing accurately a word added to a noun to qualify it.

Preposition—From Lat. *præ*, before, and *pono, positum*, to place or put; that which is placed before. A preposition is a word *placed before* a noun to govern it, and to show its relation to some other word.

Adverb—From Lat. *ad* to, and *verbum*, a word, meaning added to a verb. An adverb is a word added to a verb to qualify it.

Pronoun—From Lat. *pro*, for, and *nomen*, a name; standing for a name. A pronoun is a word used instead of a noun.

Interjection—From Lat. *inter*, between or among, and *jacio, jacitum*, to throw; that which is thrown in. An interjection is a word thrown in to express emotion.

Participle—From Lat. *pars*, a part, and *capio, captum*, to take; that which takes a part. A participle is a word which partakes of the nature of both adjective and adverb.

4. Give illustrations of the figures of speech more commonly used in English poetry.

The more commonly used figures of speech in poetry are:—

(*a*) *Personification:* inanimate objects being regarded as living beings; *e.g.*—

'Knowledge is proud that he has learned so much,
Wisdom is humble that he knows no more.'
'Chill Penury repressed their noble rage.'

(*b*) *Simile:* a comparison formed from resemblance; as—

'Pleasures are like poppies spread.'
'Like the leaves of the forest when summer is green
That host with their banners at sunset were seen.'

(*c*) *Metaphor:* the substitution of the name of an object for one to which it has some likeness.

'All the world's a stage,
And all the men and women merely players.'
'This royal throne of kings, this sceptred isle,
This other Eden, demi-paradise.'

(*d*) *Irony:* conveying a meaning quite contrary to the meaning of the words used, as—

'Brutus is an honourable man,
So are they all,—all honourable men.'
'Should I not say
Hath a dog money? is it possible
A cur can lend three thousand ducats?'

(*e*) *Apostrophe:* an address to another object n the midst of another subject of discourse.

'What cause withholds you then to weep for him?
O judgment, thou art fled to brutish beasts!'

(To be continued.)

ANSWERS TO ALGEBRA QUESTIONS IN 'THE SCHOLAR' FOR MARCH, 1883.

(1) $(m+n)(m+n)$
(2) $(a+4)(a+4)$
(3) $(x+8)(x+8)$

(4) $(r-s)(r-s)$
(5) $(x-12)(x-12)$
(6) $(3m-4n)(3m-4n)$

(7) $(m+n)(m-n)$
(8) $(12x+11y)(12x-11y)$
(9) $(x^2+3)(x^2-3)$

(10) $(x+y)(x^2-xy+y^2)$
(11) $(a+4)(a^2-4a+16)$
(12) $(3m+n)(9m^2-3mn+n^2)$

(13) $(a-x)(a^2+ax+x^2)$
(14) $(m-n)(m^2+mn+n^2)$
(15) $(x-3b)(x^2+3bx+9b^2)$

(16) $(x+12)(x+2)$
(17) $(a+9)(a+6)$
(18) $(3x+7)(3x+6)$

THE PLOUGHMAN.

Words by the BARONESS NAIRNE. *Music by* T. CRAMPTON.

Cheerfully. mf

1st TREBLE.
2nd TREBLE.

1. There's high and low, there's rich and poor, There's trades and crafts *e - nowe*, man; But
2. His dreams are sweet up - on his bed, His cares are light and few, man; His
3. The lark so sweet that starts to meet The morn - ing *blithe* and new, man; Blithe
4. All fresh and gay, at dawn of day, Their la - bours they re - new, man; God

BASS.

KEY B♭. *Cheerfully. mf*

1st TREBLE. :s₁ | s₁ :- :l₁ | s₁ :- :d | m :- :r | d :- :m | r :- :d | r :- :s₁ | m :- :- | d :- :s₁
2nd TREBLE. :m₁ | m₁ :- :f₁ | m₁ :- :m₁ | s₁ :- :f₁ | s₁ :- :s₁ | f₁ :- :m₁ | f₁ :- :s₁ | s₁ :- :- | m₁ :- :m₁
BASS. :d₁ | d₁ :- :d₁ | d₁ :- :d₁ | d₁ :- :r₁ | m₁ :- :d₁ | s₁ :- :s₁ | s₁ :- :s₁ | d₁ :- :- | d :- :d

east and west his trade's the best That *kens* to guide the plough, man.
mo - ther's bless - ing's on his head, That *tends* her well, the plough - man.
though she be, as blithe is he That sings as sweet, the plough - man.
bless the seed, and bless the soil, And pros - per aye the plough - man.

F. t.

s₁ :- :m | r :- :ˢ₁d | s :- :f | m :- :m | r :- :r | r :- :s | m :- :- | d :-
m₁ :- :s₁ | s₁ :- :ˢ₁d | t₁ :- :t₁ | d :- :s₁ | l₁ :- :l₁ | t₁ :- :t₁ | d :- :- | d :-
d :- :d | t₁ :- :ᵗ₁m | r :- :s₁ | d :- :d | f₁ :- :f₁ | s₁ :- :s₁ | d :- :- | d :-

CHORUS. *f*

Then, come, well speed, my plough-man - lad, And hey, my mer - ry plough - man; Of

B♭ f. CHORUS. *f*

:ᵈs₁ | s₁ :- :s₁ | m :- :d | r :- :t₁ | d :- :m | s :- :d | d :t₁ :d | m :- :- | r :- :r
:ᵗᵃf₁ | m₁ :- :m₁ | s₁ :- :s₁ | f₁ :- :f₁ | m₁ :- :s₁ | s₁ :- :s₁ | fe₁ :- :fe₁ | s₁ :- :d | t₁ :- :t₁
:ᵐt₁ | d :- :d | d₁ :- :m₁ | f₁ :- :s₁ | d₁ :- :d₁ | m₁ :- :m₁ | l₁ :- :l₁ | s₁ :- :- | s₁ :- :f₁

all the trades that I do ken, Commend me to the plough-man. *Symph.*

Symph.

s :- :f | m :- :r | d :- :t₁ | l₁ :- :f | m :- :d | t₁ :- :r | m :-:- | d :- | s₁ | l₁ :t₁ :d | r :- :s₁ | m :-:- | d :-
d :- :t₁ | d :- :t₁ | d :- :s₁ | f₁ :- :l₁ | s₁ :- :m₁ | r₁ :- :f₁ | s₁ :-:- | m₁ :- | m₁ | f₁ :- :m₁ | f₁ :- :f₁ | s₁ :-:- | m₁ :-
m₁ :- :r₁ | d₁ :- :r₁ | m₁ :- :m₁ | f₁ :- :r₁ | s₁ :- :s₁ | s₁ :- :s₁ | d₁ :-:- | d₁ :- | d | f₁ :- :s₁ | s₁ :- :$\frac{s_1}{s_2}$ | d :-:- | d :-

Enow, the old way of spelling enough; in many country districts the word *enow* is in use. *Kens*, the Scottish word for *knows*. *Tends*, attends, looks after, assists and supports. *Blithe*, cheerful, in good spirits.

KEY B♭ (two flats, B and E). TIME $\frac{6}{8}$, compound common time; two beats in a bar.

Notes of a Lesson on Latitude.

BY JOSEPH S. COWHAM, F.G.S.,

Lecturer on Method at the Westminster Training College.

STANDARD V.

INFORMATION:—Order in which arranged, and conclusions obtained.

MODE of imparting Information.

1. Relative Position.

Examples:

(*a*) **England** is in the west of Europe.
(*b*) **London** is in the south-east of England.
(*c*) **Europe** is west of Asia, east of America.

Use a map of Eastern Hemisphere.

After these examples have been stated by the teacher, other similar examples may be given by the scholars.

Statement derived from examples:

When we give the general direction of a place from any other known position, we state the RELATIVE POSITION of that place.

Follow this plan until the meaning of the term 'Relative Position' is understood and can be stated by the class.

2. Relative Position insufficient.

Examples:

(*a*) There are other places in the west of Europe besides England, *e.g.*, FRANCE and SPAIN.

Use the map, and supplement these examples by others given by the class.

(*b*) DOVER, again, is in the south-east of England, as well as London.

Emphasize by reference to the position of towns and villages near the school.

(*c*) The Mediterranean Sea and the northern portion of Africa are to the west of Asia, as well as Europe.

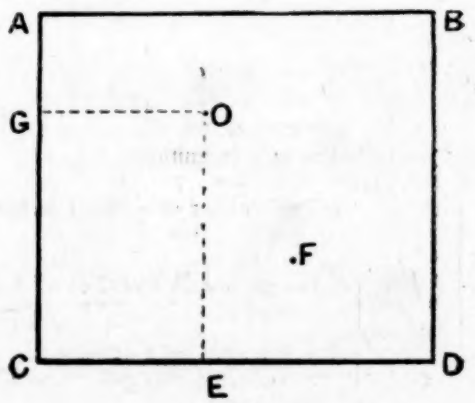
Show uncertainty arising from giving only the relative position by noting the various answers given to such questions as—
(1) Name a village to the E. of the school.
(2) Name an island to the W. of Scotland.
(3) Note the uncertainty in the movements of a boy set to find Valentia, after being told only that the island is W. of Ireland.

The relative position indicates the locality required, along with other places from which it must be chosen. Something more is required to fix the exact position of a place. What?

3. How to fix Exact or Positive Position.

(*a*) Finding exact position on a flat surface, as a board or slate.

This is done by drawing two straight lines through the point O, so that EO is 2 ft. from the side of the board CA, and parallel to it, and GO 3 ft. from the bottom CD, and parallel to it.
Similarly on a slate, by taking inches instead of feet.



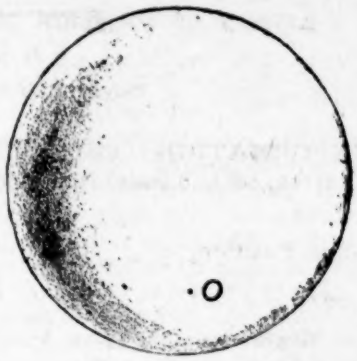
N.B.—The point O might be erased, and its position re-found exactly and readily.

Revise and enforce this portion of the lesson by such exercises as the following:—
(1) Find a point on the board 3 ft. to the left of BD and 2 ft. below AB.
(2) Place a point F in any position on the board, and by actual measurement find its exact position.
(3) Similarly on a slate, using inches instead of feet.

(b) **Finding exact or positive position on the globe.**

As in the case of the board or slate, we need first to have certain fixed positions from which we can measure the distance of the given place.

These fixed positions are the NORTH POLE, SOUTH POLE, and the EQUATOR.



Show this necessity by taking a blank globe or a cricket ball. Ask for the exact position of the point O. It cannot be stated. The relative position might be roughly stated 'Towards the lower right edge.'

N.B.—The position of the Poles is fixed by nature. They are the two points of no rotatory motion.

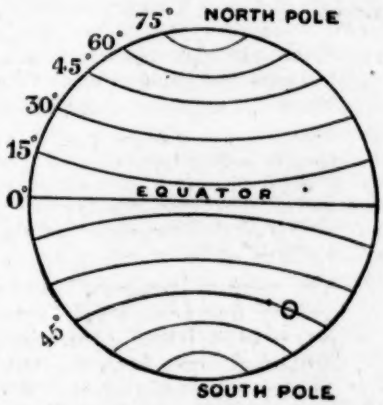
Illustrate by placing coloured wafers on the globe—one on each pole and others between. Then rotate and show the points of no movement.

N.B.—The Equator is a derived position. It is drawn round the globe midway between the Poles.

Find this by fixing a piece of string to the N. pole by a drawing pin, stretch it tightly and fasten to the S. pole. Now find the middle of this string so stretched, and with chalk draw the Equator.

The Equator is now to be used as a starting-point from which a series of lines are drawn round the globe, each of which is parallel to the Equator.

The class will most probably have taken practical geometry, and they could tell, in answer to questions, that if these lines were 1° apart, there would be 90, or rather 89 of them, between the Equator and each Pole.



In constructing these lines use the string as for the Equator. If the string be divided into six equal parts, each would represent 15°, and, by taking the different lengths thus marked, the successive lines could be drawn 15° apart, as in the diagram.

N.B.—The 90th would be the point representing the Pole.

N.B.—If one of these lines pass through the point O, the question, 'Where is the point O?' might now be repeated. The answer, 'South of the Equator,' or '45° South of the Equator,' should be obtained from the previous teaching.

(c) **Terms and Definitions.**

Terms:

(1) The lines just drawn are **Parallels.**

(1) Reference to the mode of drawing the above diagram explains this term.

Direct attention to similar parallel lines, *e.g.*, opposite walls of the school, sides of slate, etc.

(2) The full term is **Parallel of Latitude.**

(2) Refer to each line as representing breadth of space between it and the Equator, and thus account for the full term.

Definitions:

(1) A **Parallel of Latitude** is a line drawn round the globe parallel to the Equator.

(1) This definition, or words equivalent, should be obtained from the class as a result of previous teaching.

(2) **Latitude** is distance north or south of the Equator.

(2) As No. (3), and teaching further tested by questions like the following:—

1. Point out the parallels of Latitude marked on an ordinary globe.
2. Name places on the same parallel.
3. Places the same distance from the Equator
4. Places having the same latitude.

Lessons in English.

BY ALEXANDER BAIN, LL.D.

VII.—EMOTIONAL QUALITIES.

IN the preceding lesson, a view was given of the scheme of qualities growing out of the two most fundamental emotions of the human mind. These emotions do not include all poetic interest; yet their direct and indirect influences taken together, make up a very large mass of emotion. The fact that some theories of Beauty —those of Alison and Jeffrey—rest upon them exclusively is an indication of their reach or comprehensiveness.

There is, however, an incompleteness in any view of Art that excludes the primary effects of the higher senses—Sight and Hearing. There are intrinsic pleasures of colour, which count for a large share of the pleasure of a painting: and there are intrinsic pleasures of sound, which count in music and in speech. Still, the larger half of all the charms imparted through these senses, must be attributed to *associated circumstances*, and such associations are chiefly made up of the great couple of primary emotions, and derivatives from them. The Alison and Jeffrey theories erred only in regarding emotional association as the whole fact; which was to deny to the Senses, as such, the power of contributing to our pleasures.

When the associated emotions of an object of sense are the predominant circumstance, the terms used for the effect would fall largely under the nomenclature of the Emotions as set forth in last lesson. The glow of sunset has an intrinsic effect of colour, and a superadded effect of vastness and power, which determines the epithets employed to describe it: as for example, gorgeous, glorious, grand, over-powering, sublime. The violet, the daisy the daffodil, have their pleasing colours, but are still more pleasing in their suggestion of tender emotion, through their being partially personified.

The charm of pure colour needs a combination of mass, intensity, brilliancy and harmony, such as are occasionally found in nature, but are more completely realized in art. A great work of coloured design would be described by epithets expressing pleasure without involving the two great sources of special emotion: these are, —fine, gay, charming, pleasing, exquisite, delightful, tasteful, beautiful, enchanting, sweet, bright, brilliant, dazzling, graceful, fairy-like, polished. To use such a word as "lovely" is not to refer the pleasure to the loving or tender emotion, but to employ it as a figurative expression for pleasure. The nomenclature of criticism must provide for this class of effects, which belong to all forms of art. It may be remarked, however, that when the language rises to a great pitch of intensity, there is sure to be a complex product of sense and emotion.

The intrinsic pleasures of the ear receive a good many of the same epithets as those of sight, together with a few specially belonging to effects of a sound—as melodious, melifluous, silvery, sonorous, resounding, tuneful, dulcet, thrilling, musical, harmonious, deep, full, swelling, dying-away, soul-stirring.

Next to the positive pleasures, or those arising from the stimulation of the mind by proper sources of pleasure, are to be ranked the pleasures due to relief from pains. These play a great part in actual life, and are admitted into art. The beauty of smooth-working machinery, and of the appearances that suggest ease—such as polish and absence of friction—is dependent on the sense of pain from what is difficult and laborious; the re-action from which may be attended with some of our highest thrills of delight. It is a favourite device of art to plunge us into a painful state, in order to give us the enjoyable rebound of deliverance. This, however, requires a dexterous adjustment, in order to make sure that there is a gain on the whole.

The foregoing observations are meant to extend the critical vocabulary, although farther additions are still necessary in order to a complete exegesis of emotional effects. Coupled with the explanations in the previous lesson, they will enable us to take a wider scope in criticising the examples now to be adduced.

I will select for study one of the poetical gems of the language—Shelley's *Skylark*. The genius of Shelley has been exhaustively depicted by our greatest critics. The following sentence from Leigh Hunt will introduce our critical examination of a few stanzas of his exquisite ode. "His poetry is as full of mountains, seas and skies, of light and darkness, and the seasons, and all the elements of being, as if Nature herself had written it, with the creation and its hopes newly cast around her; not, it must be confessed, without too indiscriminate a mixture of great and small, and a want of sufficient shade,—a certain chaotic brilliancy 'dark with excess of light.'"

One object of these Lessons on the Emotional Qualities, is to show how to exemplify in minute detail, and by specific examples, the general deliverances of critics on the merits and defects of given authors.

The "Ode to the Skylark" is an extraordinary tissue of sustained imagery, derived from both the animate and the inanimate world. The first question that would naturally arise is, whether the subject has sufficient intrinsic merits to bear such a gorgeous accumulation of circumstances. To answer this in the negative would be set down as the proof of a cold and prosaic nature. Still, there is no evading the enquiry—what are the limits, if any, to the poetical aggrandisement of familiar things? Is the reader, from his previous knowledge of the skylark, in a frame of mind to accept the un-

measured laudation heaped upon it in the ode? In other words, is it so great a departure from all truth or probability, that we entirely lose the pleasure of adaptation or fitness of expression, and are gratified only by the profusion of glowing imagery, to which the subject has merely supplied a pretext? There can be no doubt of the eminent value of a composition that can adorn within the limits of truth, or with a very slight departure from those limits. When a poet accustoms his muse to exaggeration in small matters, there come occasions when the effect is seriously perverting. Shelley has taken up some of the noblest themes that a poet could choose; such are the joys of love and the worth of liberty. To set these forth in adequate language is a noble vocation; to overrate them, as Shelley needlessly does, is doing mankind a doubtful service.

With this reluctant *caveat*, let us quote a few stanzas.

Hail to thee, blithe spirit!
Bird thou never wert
That from heaven, or near it,
Pourest thy full heart
In profuse strains of unpremeditated art.

The Apostrophe is a good setting for the commencement. The epithet "blithe" is happy and quite within bounds. Whether the lark's feelings accord with the music of its song, we cannot tell, but we are prepared for a certain harmony between feeling and expression all through the animal kingdom. "Bird thou never wert" is a hyperbole, following out "blithe spirit" and not repugnant to our usages in speaking of what we like. The three remaining lines are also pitched high, but not too high. It is allowable to make use of the lofty associations of Heaven, when we wish to praise anything that we deem very lovely. "Pourest thy full heart" is a becoming hyperbole; and "unpremeditated art" is fairly applicable, although, as an epithet, more of an intellectual than of an emotional cast. It has the strength or impressiveness of a negative word, without possessing the unction of poetry.

Higher still and higher
From the earth thou springest;
Like a cloud of fire,
The blue deep thou wingest,
And singing, still dost soar; and soaring, ever singest.

There is nothing specially remarkable in the two first lines. The upward flight of the lark is doubtless suggestive of power and loftiness; and the expression of it is simple and effective. The third and fourth lines are intended to be still more effective, by the help of a bold simile—"Like a cloud of fire, the blue deep thou wingest." The incongruity in the comparison of the lark to a cloud of fire is evident; and the effect sought must be in the community of the emotional effect; but, even in this view, it is not a satisfying comparison. It does not recommend itself by any obvious fitness; except as keeping up the hyperbolical strain of the poem. "The blue deep thou wingest" is by itself an expressive touch, and fits the reality. The alexandrine, however, is what redeems and ennobles the stanza. It is a felicitous application of balanced phraseology, cast in a melodious line. The conjoined soaring and singing is represented in a way that could hardly be surpassed.

In the golden lightning
Of the sunken sun,
O'er which clouds are brightening,
Thou dost float and run;
Like an embodied joy, whose race is just begun.

The poet now attempts a bolder flight; and gives us a sun-set picture. "The golden lightning" seems a doubtful conjunction. The epithet is not very applicable to lightning; and lightning does not help us to conceive the colours of sunset; we should have felt more congruity had "golden" and the sun-set clouds come together at once. "The sunken sun" scarcely contributes to a picture of glorification; the word "sink" is associated with depression and pathos. No doubt the poet sought to vary the common designations of the setting sun. "O'er which clouds are brightening" is an expressive picture in itself; but there is a want of felt coherence in the entire grouping. "Thou dost float and run:" "float" is a fine metaphor; so fine that its commonness does not do away with its effect. The propriety of "run" to express a mode of flight is doubtful; probably it came in by the compulsion of the rhyme. The concluding line is one of Shelley's gorgeous similes from the feelings. An effort is required to realise the meaning; and when we do realise it, we must acknowledge that there is some straining. We understand a "joy" by itself; but the embodying of it rather puzzles us; and we are not accustomed to materalise our feelings by first putting them into a body, and then making them run a race; all which has to be done, before we apply the combination to illustrate the flight of the lark.

The pale purple even
Melts round thy flight,
Like a star of heaven
In the broad daylight,
Thou art unseen, but yet I hear thy shrill delight.

We are here carried a stage farther into night. "The pale purple even" is an apt conjunction of epithets; the addition of "melting round thy flight" is not easily conceivable as an intellectual image; the word "melt" does not compensate, by its emotional associations, for indistinctness of imagery. The last three lines contain a lofty simile, somewhat enfeebled by the filling up. The phrase "of heaven" contributes nothing to the force of the word "star." "In the broad daylight" is an addition to the wordiness. The two lines in one—"Like a star in daylight" might have been preferable. "Thou

art unseen" is a just application of the simile; but the point is marred by the clause—"but yet I hear thy shrill delight." This fact would need to be detached wholly from the comparison to a star. The words "shrill delight" might be dispensed with in favour of the simple fact of being heard; the weakness of the ode being the tendency to cloy with luscious imagery. The next stanza is in continuation—

Keen as are the arrows
Of that silver sphere,
Whose intense lamp narrows
In the white dawn clear,
Until we hardly see, we feel that it is there.

This must be taken as a protracted simile to heighten the "shrill delight." The idea of the former stanza is awkwardly repeated: the moon taking the place of the stars; but instead of being an independent picture, it is an appendage to the preceding. The shrill delight is said to be keen as the arrows of the silver sphere, which describes the moon: the epithet "silver" being habitual with the poets in this application. The picture is first to be viewed as a poetical rendering of the moon's fading under the dawn. The language is undoubtedly choice and impressive; but there is not much to come home to us in the entire conception. The word "narrowing" has not much propriety for the moon's diminished power as the dawn approaches; nor is the situation of our being reduced to "feel" its presence necessarily exciting to minds of ordinary imaginative power. The effect of the entire stanza as a simile to enhance the shrill delight of the lark cannot be said to be great; the unlikeness overpowers any likeness that the poet may have been able to fancy.

All the earth and air
With thy voice is loud,
As, when night is bare,
From one lonely cloud
The moon rains out her beams, and heaven is overflowed.

Granting the exaggeration that pervades the entire poem, this is a finely-conceived stanza, and is highly illustrative of the qualities and arts of poetry. The situation in the first couplet is simple and yet grand. The word "loud" is forced by the rhyme to cloud; otherwise we might have had "resounds." The simile in the three concluding lines is gorgeous and yet apt, if we make allowance for the disparity of light and sound. "As when night is *bare*," does not on the instant suggest the meaning of clear or cloudless; but is not beyond the license of poetry. "From one lonely cloud, the moon rains out her beams" is an expressive situation, if not coming too soon after the employment of the moon in the previous stanza. For "heaven is over-flowed" we might have the continuation of the active voice, and "overflows the heaven."

What thou art, we know not,
What is most like thee?
From rainbow clouds there flow not
Drops so bright to see
As from thy presence showers a rain of melody.

The poet now invests his subject with the charm of mystery. This attribute, however, applies to so many things, and is so well worn, that it scarcely stirs our feelings. The question "What is most like thee," might have been earlier; there being already a whole string of comparisons provided. The start is not new, and the images are from sources already drawn upon. The drops from rainbow clouds have the brightness due to sunshine; and the poet thus adds something to the ordinary image of a rain-shower. Still, we may hesitate about the intrinsic force of the comparison of the lark's song to a *rain* of melody.

Like a poet hidden
In the light of thought
Singing hymns unbidden,
Till the world is wrought
To sympathy with hopes and fears it heeded not.

Poets in all ages have described their own vocation in choice and thrilling numbers. The stanza may be viewed rather in this aspect, than as appropriate to the subject. We see, as in other stanzas, that the coercion of the metre is an obstacle to the coherence of the imagery. There is a poetic propriety in the expression "light of thought"; the difficulty lies in combining it with the "poet hidden": light and concealment do not go well together. Nor does the word "hidden," which receives so much emphasis from its position, connect itself clearly with poetic inspiration, in any view of it. "Singing hymns unbidden" is somewhat obscure; the word "unbidden" is fine intelligible Saxon; but the more obvious meaning does not strike us with any force. It may, however, mean the same as "unpremeditated" in the first stanza, and so give the idea of spontaneous flow. The two concluding lines contain an expression in unadorned terms of the poet's influence; the thought is more considered than the language. The stanza cannot be pronounced eminently successful even in its primary intention.

Like a high-born maiden
In a palace tower
Soothing her love-laden
Soul in secret hour
With music sweet as love, which overflows her bower.

Here we have a love picture under imposing circumstances. The maiden is high-born, her abode is a palace. The bearing of the word "tower" is ambiguous. It may be simply an appendage of the palace; but it may be something more. We are accustomed, in Romance, to towers as places of imprisonment; and there is an evident pathos of loneliness in the picture; while "the secret hour" suggests the need of conceal-

ment. The separation of "love-laden" and "soul" is a sacrifice to poetical necessity. The last line has a fine melody of rhythmical movement; but if a logical comparison were admissible in the criticism, we might say that the poet is illustrating in a circle. The music is brought in to intensify the love, while the love is needed to give impressiveness to the music. Grammatically, the "music" and not the "love" should be in contact with the relative "which."

Like a glow-worm golden
In a dell of dew,
Scattering unbeholden
Its aërial hue
Among the flowers and grass, which screen it from the view.

This is rather a descent from the superb picture of the previous stanza; but the poet is not marching to a climax. The new situation is melodiously rendered like the rest; but, intrinsically it seems inferior, rather than superior, in force to the main subject. It is difficult to say whether "golden" adds anything to the glow-worm, except through its emotional association of worth and brilliancy: yet, partly by this association, and partly by its metrical fitness, it makes an impressive line. The phrase "in a dell of dew" gives a fine and expressive placing to the glow-worm. "Scattering unbeholden its aërial hue" has the air of a paradox; we are to conceive the glow-worm, and yet it must be working unseen by any one; "its aërial hue" is a little far-fetched in meaning, although admirable in sound: "aërial" must not be taken in its primitive sense of the air, but in one of the associated and poetical meanings of air—the refined, exquisite, subtle, half-spiritual association. The alexandrine completes the idea of concealment; "among the flowers and grass, which screen it from the view." There is still poetry in the situation—among the flowers and grass—from the recognised emotional meanings of the words, but the relative clause is prosaic in comparison of the terseness of "scattering unbeholden."

Like a rose embowered
In its own green leaves
By warm winds deflowered
Till the scent it gives
Makes faint with too much sweet those heavy-winged thieves.

The first two lines make a fine situation, by the help of the metaphor "embowered," and the "green leaves." The third line—"by warm winds deflowered" is a harmonious addition. There is a clash in the word "deflowered," between its highly-metaphorical use, and its literal meaning, which we can scarcely help applying to the situation, thereby causing incongruity. The stress of the stanza seems laid on the scent evolved, which is heightened by the last line—"makes faint with too much sweet" the bees, humorously touched off as "heavy-winged thieves." The stanza as a whole hangs well together; while the reader has probably ceased to think of the suitability of the successive situations to enhance the charm of the lark. Each new stanza is a highly poetic rendering of some pleasing situation; but the farther efficacy of the pictures to make us feel still more highly the influence of the lark is not at all apparent.

Sound of vernal showers
On the twinkling grass,
Rain-awakened flowers
All that ever was
Joyous, and clear, and fresh, thy music doth surpass.

The first two lines give us one poetically rendered situation, and the third another. Each may be examined on its own merits as a pictorial effect. The "twinkling grass" is a striking and suggestive conjunction of the poetic stamp; the emotional effect is to glitter or dazzle, rather than to excite feeling or pathos. "Rain-awakened flowers" is a happy condensation, likewise calculated to recall a pleasant situation, and to aggrandise it at the same time, as is the purpose of poetic language. In the last line, we have merely an accumulation of well-chosen epithets, to give a sweeping general effect; and the stanza winds up by the heightening comparison, "thy music doth surpass."

While the individual stanzas now reviewed have each their poetical merit, more or less assignable and pronounced, we feel, as we go on, that the poet is talking wild or without set purpose. He is accumulating pleasant images, as such, which might be applied to any pleasant subject whatever, and have no special application to the song of the lark. Indeed, there is manifest straining throughout, in bringing images of visible beauty to compare with an effect of music or sound. The author makes scarcely any attempt to find similes of melody, but assumes an extraordinary pitch of joyous feeling in the lark as evidenced by its note, and selects at random what he considers the most joyous situations in the beauties of nature and life. His imagery gives occasion for poetic groupings and similes of high merit. They have, however, the defect of being addressed to highly-susceptible minds, and not to the ordinary average of human beings. This is as much an error in poetry, as when a scientific expositor considers only minds of his own stamp, and does not illustrate down to the level of an ordinary understanding.

An interesting parallel might be drawn between the present ode and Keats's Ode to the Nightingale. We might, I think, show that the poetic force and richness of Keats even surpasses Shelley, while the exaggeration and the irrelevance are much better kept within bounds. The happiness of the bird is not overdone in the same glaring style; there is no

attempt to heighten it by unsuitable and highly-wrought comparisons. It is made to take part in a number of imaginative situations, to all which it lends a harmonizing accompaniment. The few comparisons employed are more in keeping, by being drawn from music—"thy high requiem," "thy plaintive anthem." The length of the stanza makes a material difference to the poem; the greater scope for accumulated imagery is at once a facility and a difficulty; yet, for sustained harmony, the poetry of all ages might be searched in vain to surpass the second stanza.

(To be continued.)

The New Class-Subject, 'Elementary Science.'

BY RICHARD BALCHIN.

IN last month's issue of this magazine the reader will find a detailed syllabus of a year's course of lessons in 'Elementary Science' for Standard I. Since writing it, I have had conversations upon the subject with several teachers, whose opinion seems to be that I have attempted far too much for such very young children as we find in Standard I. 'If,' said one, 'I am expected to take such a wide range of subjects in even my lowest class, I shall certainly give up all idea of venturing upon "Elementary Science."'

I can plainly discern that most of us have the fear of an examination before our eyes—a fear which I believe to be quite groundless. Surely no inspector will require that all the facts taken up in the year's course shall be retained in the memories of these little seven-year-old babies! I assume the examination will be with a view simply of discovering whether there has been given throughout the year an intelligent course of object lessons.

Again, it appears to me that the question as to whether a syllabus is, or is not, too full depends altogether upon the way in which each subject is treated. With Standard I., surely the lesson will be to a great extent an interesting conversation between children and teacher, where a good deal of the subject under discussion will be suggested by the remarks of the children themselves. I am always sorry to see the children discouraged to put questions. It should be quite the contrary; the class ought to be stimulated even to criticise at every point. I may here remark that a great deal too much attention is often paid to what is called the orderly appearance of the children. The teacher must have every child 'upright,' 'arms folded,' and all sitting in 'perfect rows.' The consequence of all this is that the little ones are worried all through the lesson out of half their senses lest their bodies should not be exactly at right angles to the desks, or their little heads perfectly *square* with their trunks. Now, I do not of course know what is the experience of other teachers, but in my own case it generally happens that about five minutes after I have begun the lesson, the boys at each end of the class have risen off their seats altogether, and are leaning half over the desks, watching me and what I am about with the most intense eagerness. In their sparkling, attentive eyes I have all I want. The youngsters have, in fact, quite forgotten how they are sitting, and so indeed have I. All our thoughts are in another direction. I am quite aware that all this is very unorthodox; but 'it is the letter that killeth, but the spirit that giveth life.'

As to the way in which the subjects in my syllabus shall be treated, I would suggest that three or four ideas are the very utmost that should be attempted in one lesson. What those ideas shall be must of course be decided by the teacher beforehand. Around these main points the matter of the lesson will cluster; and, as I have just said, much will be suggested by the remarks of the children.

Last week I gave a lesson to my first standard upon 'Food Generally; Why we Eat and Drink.' It was determined that in the half-hour these three main ideas should be evolved. 1st, We eat because we grow bigger; 2nd, because we wear out; and, 3rd, because we want to be warm. As secondary ideas, it should be shown that growing children eat from reasons 1, 2, and 3. That people who have done growing eat from reasons 2 and 3; and that very old people who are past work, mostly from reason number 3. This, then, is the 'matter' of the lesson.

The following is, as near as I remember, a reproduction of the same. The blackboard is up, and empty; and in front of the children are specimens of wheat, oats, and barley, and pictures of a cow and a sheep.

Jones, will you come out here? Were you in the infant school two years ago? Ans.—Yes, sir. Ah! I thought I remembered you. You were only a very little fellow then. Dear me! How heavy you are! (lifting him a little off the ground). Was Jones as heavy as this when he was in the infant school? Ans.—No, sir. How is it he has become so heavy? Ans.—He is bigger. Do you think he will get any bigger than he is now? Ans.—Yes, sir; as big as a man. Yes, when he is in the third standard he will be much bigger. I should then find him much heavier than he is now. What is this part of him called? Ans.—His hand. Will that get bigger? Ans.—Yes. What do I feel here? (touching his elbow). Ans.—Bone. Will that get bigger? Ans.—Yes. Tell me some other parts of his body that will get bigger? Ans.—His head: his hair: his flesh: his nails. Suppose, in the two years since I saw him in the infant school he has become twenty pounds heavier; then, of course, twenty pounds must have been added to his body. Tell me to which part of his body this has been added. Ans.—All over. Do you mean only on the outside? Ans.—No, sir; to every part. Very well. Then, if that is true, Jones must have added to his body twenty pounds of bone, and flesh, and hair, and nails, and so on. Is that true? Ans.—Yes, sir; No, sir. Some boy says 'No.' Well? (A boy)—Where could Jones get the hair and the nails from? That was just the question I was about to ask you. Where did Jones get this twenty pounds from? Ans.—From what he ate. What! (turning to Jones) have you been eating twenty pounds of flesh, and bones, and hair, and nails, during the last two years? Ans. (Jones)—No, sir; of course not. (A boy, standing up and stretching out his arm to the utmost). Well? Ans.—Yes, he has; he couldn't get them into his body any other way. (Another boy)—Please, sir, you can't eat bones! (Another boy)—I wouldn't eat 'hair.' (Another boy)—I would with some treacle. Now, stop a minute,

boys. Robinson says all the different parts of Jones's body must have obtained this twenty pounds' increase from his food, because he could not have got it in any other way. And if we think a little about it, we shall find that Robinson is right. Smith, what are you going to have for dinner? Ans.—'Pud'n.' He says 'Pud'n;' what does he mean? Ans.—'Pudding.' Just so. What are you to have? Ans.—Bread-and-treacle. And you? Ans.—Sausages. And you? Ans.—Meat-pie. Now, is it not a very strange thing that from such materials as pudding, sausages, bread-and-treacle, and such like, our bodies can form bone, and flesh, and hair, and nails? Ans.—Yes, sir; very strange. It is; but it is quite true. Suppose a boy were to lose his appetite, and eat scarcely anything for a few days, how would he begin to look? Ans.—Very thin and pale. Then, would Jones have grown as big as he is if he had not eaten well? Ans.—No, sir. Then tell me one reason why we eat. Ans.—Because we get bigger. Very good. I will write that on the blackboard.

Do you think I shall grow any bigger than I am? Ans.—No, sir; you have done growing. Then *I* can leave off eating, eh? Ans.—No, sir; you would die. But what do I want to eat for if I do not get any bigger? My bones will get no heavier than they are now; nor will my flesh. And my skin will get no larger. (A boy)—Please, sir, your hair will go on growing. Will it? I am not so sure about that; there's a part on the top of my head where I don't believe another single hair will grow. (Another boy)—You must go on eating or you could do no work. Why? No answer. Well, now listen, boys. I went into my garden last evening to do a little digging; but I found I had to stop, because the spade was too old; it had got so thin that it bent when I tried to turn up the ground. Why was this? Ans.—It was worn out. How did it get to be so worn? Ans—By working with it so long. But how is it that I do not wear out as well as the spade? Ans.—Because you are alive. (Another boy)—I know, sir; it is because you eat, and the spade does not. (Another boy)—Please, sir, you do wear out. Do I? Ans.—Yes, sir. Then if I wear out why do I not get smaller and smaller like the spade? Ans.—Because you keep eating every day. Just so. Do you boys wear out? Ans.—No, sir. Why not? Ans.—Because we don't work. But you are always running about, even in your play, and you get as tired and hot with that as I do with my digging. Well, now tell me another reason why you and I eat food. Ans.—Because we wear out. Yes. I will write that on the board.

Now, do you boys think I shall keep on working all my lifetime? Ans.—No, sir. What makes you think I shall not? Ans.—Because you will get too old. Ah! perhaps so. Well, if a man gets very old he neither grows any bigger nor wears away by working, you say; does *he* want food? Ans.—Yes, sir, old people eat. Why? Do they work, and so wear away? Ans.—They walk about and do little things. Ah! the fact is, boys, there is always a great deal of work going on in our bodies that most of you think nothing about. You know that the heart is always beating. The lungs are always breathing. The tongue is seldom still. Now all this is work, and work means wearing away. And all this is going on in the case of very old people the same as with you. Therefore for all this wear what must old people take? Ans.—Food. Yes: and there is another reason. It is found that when the body is very cold indeed, none of this inside work can go on: it all stops. You have heard of people being lost in the snow. They lay down on the cold ground; then the heart beats slower and slower, and the breath gets shorter and shorter, till at last it all stops, and they die. I read of a poor woman who had her little baby with her, and she lost her way over some snow-covered hills. She felt tired and sleepy, and sat down on the cold ground. She took off her thick shawl, and wrapped it close round her little darling; then she pressed it to her bosom, and in the morning some people found the dead mother, with the live child in her arms. Now what made the mother die? Ans.—The cold. Ans.—What kept the baby alive? Ans.—The warm bosom of the mother. Yes, and it is nearly the same with all of us. Our bodies must keep at a certain warmth or we cannot live. Now, if you see a fire getting low, and seemingly going out, what do you know must be done? Ans.—Put on some more coals. Just so. And our food is to our bodies something like the coal to the fire: it keeps it up. Now you see there is another reason why we eat food. What do you think it is? Ans.—To keep us warm. I will write that, also, on the board. We have now three reasons for eating and drinking. Now you may take out your slates and write out what you see on the board. End of lesson.

In next month's issue I will give the subject-matter of the next few lessons.

(*To be continued.*)

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Science Notes.

M. PASTEUR'S RESEARCHES INTO THE NATURE OF HYDROPHOBIA.—Recently we called attention to the work of M. Pasteur on the prevention of splenetic fever by inoculation, and mentioned that he was investigating hydrophobia. Lately his observations and experiments have been published, and they lead to the hope that at some not very distant date this dreadful disease may be much mitigated. He finds, as we should expect, that the virus of rabies is to be found in the saliva; but he traces it beyond that point to its source in the centre of the nervous system. Inoculation through the blood by a bite is by no means invariably fatal, and a dog which recovers after such an inoculation is incapable of taking the disease a second time. M. Pasteur has now four dogs in this condition, and he claims that they are proof against hydrophobia. From his experiments he concludes that as man never contracts rabies, except from the bite of an animal suffering from it, it may not be impossible to devise means for protecting him against such accidents. M. Pasteur's remarks on the nature and varieties of the disease are full of interest.

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THE EXCITING PROPERTIES OF OATS.—Our knowledge of the alkaloids found in the vegetable kingdom has lately received rather a curious addition. It has long been thought that there are many more of these complex bodies than have been described, some botanists holding that nearly every plant has its special one. It is not, however, among the cereals under cultivation for food that we should have expected to meet with one prominently. Lately it has been thought

that oats are essentially exciting to the animals fed upon them, and in order to clear up the point M. Sanson has carried out a series of experiments. In horses, which were the animals observed, the nervous and muscular excitability were carefully noted by graduated electrical apparatus before and after they had eaten a given quantity of oats, and it was found that they exerted a sensible stimulating influence. M. Sanson then investigated the chemical nature of this new drug, and succeeded in isolating a certain principle, to which he gives the name of *avenine*. The pericarp or outer coating of the grain contains this substance, which is soluble in alcohol, uncrystallizable, and finely granular. It has the property of exciting the motor cells of the nervous system. M. Sanson says that all oats contain it, but in very different degrees; as a rule, black oats have more of it than white ones, though the amount present seems to depend not only on the variety of oat but also on the place of its cultivation. The quantity necessary to stimulate a horse seems to be about 0·9 per cent. of the drug in the weight of air-dried oats. If the grains be crushed, the exciting property is weakened; the action takes places more rapidly, but the effects are not so strong, and soon pass off.

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NEW PROCESS OF COKE MANUFACTURE.—Sir J. W. Pease, M.P., has recently introduced a new process by which he is able to get coke pure from deleterious products, and at the same time to get a greater out-turn from the raw material. By it he rescues valuable products, as tar and ammoniacal liquor, which in the old process were wasted. The same process has been introduced at Glasgow, with considerable success.

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ENCILAGE, THE NEW FODDER.—At the recent meeting of the Society of Arts a very valuable paper was read by Professor Thorold Rogers, M.P., the subject being the new mode of storing green crops for use as fodder. This discovery is the work of M. Goffart, a gentleman living near Orleans. By it instead of green crops being converted into hay, they are stored as they are, in air-tight and water-tight pits. In these pits they are packed as closely as possible and well trodden down, so that they settle evenly in the pit, and are then pressed down by weights laid on the surface of the mass. The favourite crops for this treatment are rye, green oats, grass, clover, trifolium, and almost all other leguminous plants. Fodder so preserved will, supposing it to be properly stored, keep for almost any length of time; the animals devour it well, and it keeps them in good condition. Cows fed on it yield more butter and milk than those fed on fodder preserved in the ordinary way. Dr. Voelcker, Mr. Duncan, and several other gentlemen of practical experience, took part in the discussion that took place on Professor Rogers's paper.

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THE NEW DEGREES AT CAMBRIDGE.—The university authorities at Cambridge have just decided to establish a further degree in both science and letters. The regulations for these two faculties have now been published by the Syndicate. The degrees, which will be Doctor of Science (D.S.) and Doctor of Letters (D.L.) respectively, are to be for the purpose of encouraging original research in both these fields of study. It is required for either of them that the candidates shall have given proof of eminence in their subject by some original contribution to the advancement of science or learning, and according to the regulations very severe scrutiny will be brought to bear upon any claims. Candidates can only take the degree after having been a master in some faculty for five years, or after having been Bachelor of Medicine seven years.

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IMPROVEMENTS IN CARBONIC OXIDE MANUFACTURE.—We are indebted to Herr Noack for a method of producing this gas in a state of great purity at very much less cost than has hitherto been the case. The action depends on the behaviour of zinc in the presence of the higher oxide of carbon (CO_2). That this reduces CO_2 to the lower state of oxidation has been long known, but the fact has not been utilised to the full extent. Herr Noack takes the zinc in the form of powder, and after heating it to a temperature of 400° C., passes the carbonic anhydride over it. The results are most satisfactory both as regards purity and cost.

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APPLICATION OF ELECTRICITY TO HUMANE PURPOSES.—A new invention, or rather a new application of electricity, which has been introduced by Mr. St. George Lane-Fox, is of rather a remarkable nature. It is directed against the revolting practice, which obtains at the knacker's yard, when used-up horses are made to pay the debt of nature. The process of slaughtering which is usually adopted need not be dwelt upon, further than to remark that in it sickening cruelty is often perpetrated, through the incompetence of bungling operators. The pole-axe is the weapon generally employed, and the results of inaccurate aim with this weapon may easily be imagined. But by adopting Mr. Lane-Fox's process and apparatus, the process of slaughtering is rendered easy and certain in its mode of carrying out, and the animal is made to suffer no pain prior to its death. The animal is killed by an electric shock of great strength being sent through its body. The reason of the painlessness of this mode of death-dealing is explained by physiologists thus:—A nervous impulse cannot be communicated to the brain in less than a tenth of a second, and another tenth of a second must elapse before the impulse can be converted into a sensation. Therefore, one-fifth of a second must elapse between the infliction of an injury and the sensation of pain following it. But the shock sent through the animal by Mr. Lane-Fox's apparatus would paralyse every fragment of nervous tissue in the animal in about one hundred thousandth part of a second. The mechanism by which pain could be produced is thus destroyed before the sensation of pain could be developed. The mode in which the electric discharge is administered is this:—An animal which is to be killed has the top of its head and its feet and legs wetted with salt water. It is then led into a stall and made to stand on an iron plate, connected with the negative pole of a strong condenser. The positive pole is now made to touch the animal's head, and the whole discharge instantaneously takes place through its body. Consequently, it falls dead at once. Mr. Lane-Fox estimates that for £500

such an electrical apparatus can be fitted up in any stable, and the cost of its maintenance is trifling. Unfortunately, the method cannot be applied to the slaughtering of animals for food, as it is found that the blood cannot be extracted from the carcase. This, of course, recalls the fact that animals killed by a lightning flash cannot afterwards be made available for eating, though they may not be charred or otherwise structurally injured.

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ANSWERS TO
Pupil Teachers' Examination Papers.
JAN. 27TH, 1883.
CANDIDATES.

Three hours and a half allowed for this paper.

Arithmetic.

MALES.

1. Find by practice the cost of 3,071 articles at £1 18s. 10½d. each.

		£	s.	d.
Value of 3,071 arts. at £1 each	=	3,071	0	0
,, ,, £2 ,,	=	6,142	0	0
Deduct ,, ,, 1s. = 1/20 at £1	=	153	11	0
and ,, ,, 1½d. = ½ ,, 1s.	=	19	3	10½
		£172	14	10½

£6142 − £172 14s. 10½d. = £5969 5s. 1½d. Ans.

2. Find the cost of 15 chests of tea, each weighing 1 cwt. 18 lbs. at £12 14s. 4d. per cwt.

Weight of 15 chests = 1 cwt. 18 lbs. × 15 = 17 cwt. 1 qr. 18 lbs.

		£	s.	d.
Cost of 1 cwt.		12	14	4
				17
,, 17 ,,	=	216	3	8
,, 1 qr. = ¼ value of 1 cwt.	=	3	3	7
,, 14 lb. = ½ ,, 1 qr.	=	1	11	9½
,, 4 ,, = 1/7 ,, ,,	=	0	9	1
		£221	8	1½. Ans.

3. If a bankrupt's debts amount to £7250, and his creditor lose £6011 9s. 2d., how much can he pay in the £?

£7250 : £1238 10s. 10d. :: £1 : ?

$$\frac{£1238\ 10s.\ 10d.}{7250} = 3s.\ 5d.$$ Ans.

4. If 3 cwt. 2 qrs. be carried 41 miles for 15s. 9d., how far could 5 cwt. 14 lbs. be carried for the same money?

5⅛ cwt. : 3½ cwt. :: 41 miles : ?

$$\frac{41 \text{ miles} \times 7 \times 8}{2 \times 41} = 28 \text{ miles.}$$ Ans.

5. If when wheat is 48s. a quarter the 8d. loaf weighs 3½ lbs., what would be the weight of the 5d. loaf when wheat is 42s. a quarter?

42s. : 48s. } :: 3½ lbs. : ?
8d. : 5d. }

$$\frac{7 \text{ lbs.} \times 48 \times 5}{2 \times 42 \times 8} = 2\tfrac{1}{2} \text{ lbs.}$$ Ans.

FEMALES.

1. Make an invoice of the following articles:—

19½ yds. of calico at 7½d. per yd.
16¼ yds. of flannel at 1s. 2d. per yd.
11¼ yds. of holland at 10d. per yd.
15½ yds. of print at 8½d. per yd.
3¾ yds. of muslin at 1s. 6d. per yd.
17½ yds. of linen at 1s. 3d. per yd.
13½ yds. of sheeting at 1s. 5d. per yd.
9 yds. of ribbon at 7¾d. per yd.
10½ yds. of ribbon at 4½d. per yd.

			s.	d.		£	s.	d.
19½ yards	at		0	7½	=	0	12	2¼
16¼ ,,	,,		1	2	=	0	19	6½
11¼ ,,	,,		0	10	=	0	9	7
15½ ,,	,,		0	8½	=	0	10	11¾
3¾ ,,	,,		1	6	=	0	5	7½
17½ ,,	,,		1	3	=	1	1	10½
13½ ,,	,,		1	5	=	0	18	9¾
9 ,,	,,		0	7¾	=	0	5	9¾
10½ ,,	,,		0	4½	=	0	3	11¼
						£5	8	3¾ Ans.

2. Find the cost of 29 qrs. 5 bush. 2 pks. 1 gal. 3 qts. of wheat at 42s. 8d. per quarter.

		£	s.	d.
Cost of 1 qr.	=	2	2	8
				29
,, 29 ,,	=	61	17	4
,, 4 bus. = ½ cost of 1 qr.	=	1	1	4
,, 1 ,, = ¼ ,, 4 bus.	=	0	5	4
,, 2 pks. = ½ ,, 1 ,,	=	0	2	8
,, 1 gal. = ¼ ,, 2 pks.	=	0	0	8
,, 2 qts. = ½ ,, 1 gal.	=	0	0	4
,, 1 ,, = ½ ,, 2 qts.	=	0	0	2
		£63	7	10 Ans.

3. 13,743 at £3 13s. 1½d. each.

		£	s.	d.
Value of 13,743 arts. at £1 each	=	13,743	0	0
				3
		41,229	0	0
,, ,, 10s. = ½ val. at £1	=	6,871	10	0
,, ,, 2s. = ⅒ ,, 10s.	=	1,374	6	0
,, ,, 1s. = ½ ,, 2s.	=	687	3	0
,, ,, 1d. = 1/12 ,, 1s.	=	57	5	3
,, ,, ½d. = ½ ,, 1d.	=	14	6	3¾
		£50,233	10	6¾ Ans.

4. A grazier purchased 17 cows from a farmer at 9½ guineas each, for which he gave a hundred sovereigns and 66 sheep; what were the sheep valued at per head?

	£	s.	d.
17 cows at 9½ guineas each =	169	11	6
Deduct	100	0	0
∴ 66 sheep cost	69	11	6
and 1 ,, ,,	1	1	1 Ans.

Grammar.

1. 'Ever the hollow path twined on
Beneath steep bank and threatening stone:
A hundred men might hold the post
With hardihood against a host.
This rugged mountain's scanty cloak
Was dwarfish shrubs of birch and oak,
With shingles bare and cliffs between.'—SCOTT.

Parse all the verbs and nouns in the above.

path—com. noun, neut., sing., nom., subj. of 'twined.'
twined—reg. intrans. verb, indic., past indef., 3rd pers., sing., agr. with subj. 'path.'
bank—com. noun, neut., sing., obj., gov. by 'beneath.'
stone— ,, ,, ,, ,,
men—com. noun, mas., plur., nom., subj. of 'might hold.'
might—auxiliary of mood, past of 'may.'
hold—pres. infin.
might hold—irreg. trans. verb, *hold, held, held*, potential, past indef., 3rd pers. plur., agr. with subj. 'men.'
post—com. noun, neut., sing., obj., gov. by 'might hold.'
hardihood—abstr. noun, neut. sing., obj., gov. by prep. 'with.'
host—com. coll. noun, neut., sing., obj., gov. by prep. 'against.'
mountain's—com. noun, neut., sing., poss., attrib. to 'cloak.'
shrubs—com. noun, neut., plur., nom. after 'was.'
birch, oak} com. nouns, neut., sing., obj., gov. by 'of.'
shingles, cliffs} com. nouns, neut., plur., obj., gov. by 'with.'

2. How may adjectives be classified? Give examples of adjectives in each class.

There are three main classes of adjectives.

(1) Qualifying, as *virtuous, beautiful, grand.*
(2) Quantifying, as *one, thirty, many.*
(3) Distinguishing, as *this, yon, former.*

Geography.

1. Describe the journey of a traveller by land from London to Bristol, and then from Bristol to Chester, naming in order the counties he would pass through, the chief towns in his route, and any important physical features of the country. What railways could he travel by?

Leaving London by the Great Western Railway, the traveller crosses *Middlesex* and enters *Berkshire*, visiting the important town of *Reading*. Proceeding up the valley of the Thames, he skirts the vale of the White Horse, and is carried into *Wiltshire* on the north side of the *Marlborough Downs*. Leaving Wilts, he crosses into *Somersetshire*, reaches *Bath*, and immediately afterwards arrives at *Bristol*. Continuing his journey, the traveller takes a turn at right angles to his former route, and passes along the west side of the *Cotswold Hills*, through *Gloucestershire*, to *Cheltenham*. Crossing the *Vale of Evesham*, he enters *Worcestershire*, and following the *Valley of the Severn*, passes *Worcester* and *Kidderminster*. Still proceeding north, he now finds himself in *Salop*, and after visiting *Wolverhampton* and *Bridgenorth*, crosses *Colebrook Dale* to *Shrewsbury*. He afterwards has a straight run to *Cheshire*, and finds his destination, *Chester*, situated on the Dee, to be the oddest and most picturesque town in England.

2. Describe as fully as you can Lake Windermere, the River Wye, the Frith of Clyde, and the Giant's Causeway.

Lake Windermere, the largest lake in England, lies between Westmoreland and Lancashire, but chiefly in the latter; it is ten and a half miles long and one mile broad, containing a number of islands, which form, for the most part, a cluster near the middle.

The *River Wye*, a beautiful river of Wales, rises in the south of Montgomeryshire, traverses Radnor and Herefordshire, separates Monmouth from Gloucester, and falls into the Severn below Chepstow.

The *Frith of Clyde* is almost land-locked by the long peninsula of Cantyre, and narrows to the estuary of the River Clyde. It forms two sea-lochs, Loch Long and Loch Fyne, which stretch into the Highlands in a northerly direction. In this frith lie a group of islands, the largest of which are Arran and Bute. It is commercially by far the most important frith in Scotland.

The *Giant's Causeway* is a celebrated promontory and natural curiosity on the N. coast of Antrim, in Ireland. It is composed of at least 30,000 lofty and regular columns, which run into the sea, and afford the finest specimens of columnar basalt in Europe.

Composition.

Write from dictation the passage given out by the Inspector.

Dictation.

(For the Examiner.)

The passage should be read *once* distinctly, and then dictated *once* in portions as marked.

It is essential that there be no complaint on the part of the candidates that they could not hear or understand; you can only prevent this by clearness, accuracy, and audibility.

Write the following passage from dictation:—

The house and farm buildings | lay in a basin | on the summit of a hill. | The yards, barns, and stables | were all in a condition | of picturesque decay, | a curious jumble | of gables, roofs, and green mossy thatch. | All were embosomed | in foliage, | and three ponds | lay dark and cool | under the shade of old thorns. | Round the house itself | ran a moat | which was never quite dry, | whose banks were fringed | by a tangled mass | of hazels, mountain ash, and elder; | the branches | struggling in wild luxuriance, | the grass growing | thick and rank | underneath, | and the water-hens | popping backwards and forwards | from the moat | to a stagnant pool | under the overarching boughs.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Alexandria.*

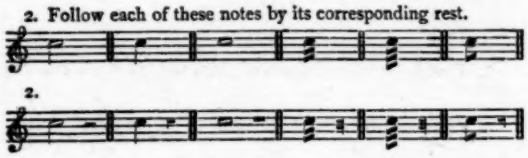
Write, in small hand, as a specimen of copy-setting, *Great Jupiter be praised: Lucius is taken.*

Music.

A quarter of an hour allowed for this paper.

1. Write over each of the following notes its pitch name (C, D, *Do, Re,* or other), and under each its duration name (crotchet, quaver, or other).

2. Follow each of these notes by its corresponding rest.



3. Supposing we make one beat while we sing a crotchet, how many shall we make while we observe a semibreve rest?

3. If we make one beat while we sing a crotchet, we shall observe *four* at a semibreve rest.

FIRST YEAR.

Three hours and a half allowed.

Arithmetic.

MALES.

1. Simplify $\dfrac{4\frac{3}{8}+4\frac{1}{2}\text{ of }4\frac{3}{8}}{4\frac{1}{8}-2\frac{1}{2}\div 1\frac{1}{3}} \div \dfrac{11\frac{1}{2}}{\frac{1}{3}(4\frac{1}{2}-\frac{3}{4}\text{ of }1\frac{1}{3})}$

$$\frac{\frac{35}{8}+\frac{273}{16}}{\frac{33}{8}-\frac{3}{16}} \div \frac{\frac{23}{2}}{\frac{1}{3}(\frac{9}{2}-\frac{9}{10})} =$$

$$\frac{\frac{70+273}{15}}{\frac{42-21}{10}} \div \frac{\frac{56}{5}}{\frac{1}{3}\left(\frac{45-9}{10}\right)}$$

$$\frac{343\times 10}{15\times 21} \div \frac{1}{3}\left(\frac{56}{5}\div\frac{36}{60}\right)$$

$$\frac{343\times 10\times 5\times 36}{15\times 21\times 56\times 60} = \frac{7}{12}\text{ Ans.}$$

2. Reduce ·35 of £1 to the decimal of £2 2s. 8d.

$$\frac{\cdot 35\text{ of }£1}{£2\ 2s.\ 8d.} = \frac{240d.\times\cdot 35}{512d.} = \frac{84}{512} = \frac{21}{128} = \underline{\cdot 1640625}\text{ Ans.}$$

3. Find the value of 3·4583 of £5; and 3·29875 acres.

(*a*)
£
3·4583 = £17 5s. 10d.
5
£17·2916
20
5·83 s.
12
10·00d.

(*b*)
3·29875ac. = 3ac. 1ro. 7¾po.
4
1·19500ro.
40
7·80000 po.
Ans.

4. State the rule for converting recurring decimals into vulgar fractions.

Rule.—If the repeater or circle is *pure*, make it the numerator and for the denominator put as many nines as there are figures in the numerator.

If the recurring decimal is *mixed*, subtract the finite part from the numerator, and make the denominator of as many nines as there are recurring figures, followed by as many ciphers as there are figures in the finite part.

5. A man who possesses ·27 of a ship sells ·416 of his share for £3,240; what is the ship worth?

$$\cdot416 \text{ of } \cdot27 = \tfrac{416}{999} \times \tfrac{27}{99} = \tfrac{8}{77}$$
$$\tfrac{8}{77} : 1 :: £3240 : \text{value of ship}$$
$$\frac{£3240 \times 44}{5} = £28{,}512 \text{ Ans.}$$

FEMALES.

1. If 9 men working 9 hours a day, earn £26 6s. 6d. in 13 days; what will 13 men earn in 17 days, working 11 hours a day?

$$\left.\begin{matrix} 9 \text{ men} : 13 \text{ men} \\ 9 \text{ hrs.} : 11 \text{ hrs.} \\ 13 \text{ das.} : 17 \text{ das.} \end{matrix}\right\} :: £26\ 6s.\ 6d. : ?$$
$$\frac{6318d. \times 13 \times 11 \times 17}{9 \times 9 \times 13} = 14586d. = £60\ 15s.\ 6d. \quad \text{Ans.}$$

2. What will an agent's commission on the sale of £475 worth of goods amount to, at 1¼ per cent.?

$$\frac{£475 \times 1\tfrac{1}{4}}{100} = \frac{£475 \times 5}{400} = £5\ 18s.\ 9d. \quad \text{Ans.}$$

3. How much will a creditor lose on a debt of £2,456 16s. 8d., when a bankrupt can pay only 12s. 10½d. in the pound?

7s. 1½d. is lost on every £

A loss of £1 per pound				=	2456	16	8
,,	5s.	,,	= ¼ of loss at £1 =		614	4	2
,,	2s.	,,	= 1/10 ,, ,, ,, =		245	13	8
,,	1½d.	,,	= 1/160 ,, ,, ,, =		15	7	1½
					£875	4	11½

Ans.

4. If 4 men by working 10½ hours a day can mow a field of grass 189 yards long and 160 yards broad in 3 days; how many hours a day must 3 men work to mow a field 275 yards long and 144 yards broad in 5 days?

$$\left.\begin{matrix} 3 \text{ men} : 4 \text{ men} \\ 5 \text{ days} : 3 \text{ days} \\ 189 \text{ yds.} : 275 \text{ yds.} \\ 160 \text{ yds.} : 144 \text{ yds.} \end{matrix}\right\} :: 10\tfrac{1}{2} \text{ hrs.} : ?$$
$$\frac{21 \text{ hrs.} \times 4 \times 3 \times 275 \times 144}{2 \times 3 \times 5 \times 189 \times 160} = 11 \text{ hours.} \quad \text{Ans.}$$

Grammar.

1. 'There is sweet music here that softer falls
Than petals from blown roses on the grass,
Or night dews on still waters between walls
Of shadowy granite in a gleaming pass;
Music that gentlier on the spirit lies
Than tired eye-lids upon tired eyes.'—TENNYSON.

(*a*) Name the prepositions in the above, and show between what nouns each preposition shows the relation.

(*b*) Parse each word in the last two lines of the above.

(*c*) What is the more usual mode of comparing '*gently*,' and what is the rule for the comparison of adverbs?

(*a*) PREPOSITIONS.

'*from*'	showing the relation between	'petals'	and	'roses'
'*on*'	,, ,, ,,	'petals'	and	'grass'
'*on*'	,, ,, ,,	'dews'	and	'waters'
'*between*'	,, ,, ,,	'waters'	and	'walls'
'*of*'	,, ,, ,,	'walls'	and	'granite'
'*in*'	,, ,, ,,	'granite'	and	'pass'
'*on*'	,, ,, ,,	'music'	and	'spirit'
'*upon*'	,, ,, ,,	'eye-lids'	and	'eyes'

(*b*) '*music*'—abstr. noun, neut., sing., nom., subj. of (is).
'*that*'—simple rel., referring to 'music,' neut., sing., 3rd pers. nom., subj. of 'lies.'
'*gentlier*'—adv. of manner, comp. deg., modifying 'lies.'
'*on*'—prep., gov. obj. case 'spirit.'
'*the*'—def. art. or dist. adj., limiting 'spirit.'
'*spirit*'—abstr. noun, neut. sing. obj., gov. by 'on.'
'*lies*'—irreg. intrans. verb, *lie*, *lay*, *lain*, indic. pres. indef. 3rd pers. sing., agr. with 'that.'
'*than*'—subord. conj.. connecting 'tired eyelids, etc.' with 'that gentlier lies, etc.'
'*tired*'—part. adj., qual. 'eye-lids.'
'*eye-lids*'—com. noun, neut. plur., nom., subj. of (lie).
'*upon*'—prep., gov. obj. case 'eyes.'
'*tired*'—part. adj., qual. 'eyes.'
'*eyes*'—com. noun, neut. plur. obj., gov. by 'upon.'

(*c*) The more usual mode of comparing '*gently*' is *more gently, most gently.*

Adverbs are compared like adjectives; but *more* and *most* are preferred to *er* and *est* in comparing adverbs of more than one syllable.

2. Distinguish between personal and demonstrative pronouns. Name the personal pronouns.

Personal pronouns may be used instead of a noun, as when the speaker, without naming himself, or the person to whom, or of whom he is speaking, says, '*I* am here'; '*You* know it,' '*He* is wise who speaks little.'

Demonstrative pronouns prevent the repetition of a noun that has already been employed, as, 'Tom never stands still, *he* is so restless.'

The real personal pronouns are *I* and *thou* with their plurals *we* and *ye* or *you*.

Geography.

1. Describe fully the journey of a traveller from Paris to Vienna, and then down the Danube to its mouth.

Leaving *Paris* the traveller proceeds easterly by rail through France to the famous city of *Strasburg*, northwards up the *Rhine Valley* to *Carlsruhe*, in Baden, eastward to *Stuttgart*, the capital of Wurtemberg, and then to *Ulm*, on the Danube. Leaving Ulm he proceeds into *Bavaria*, and visits *Augsburg* and *Munich*, near which is the battle-field of Hohenlinden; enters *Austria* and reaches *Linz*, on the Danube. A short run down the valley of that river brings him to *Vienna*, the capital of Austria. Taking boat at Vienna, he is carried to *Presburg* and *Komorn*, turns south to *Buda-Pesth*, which lies on both sides of the river. At *Belgrade* he enters Turkish territory, and at *Orsova* he passes the rapids of the *Irongate Pass*. On his voyage to the Black Sea he visits in succession *Widdin*, *Nicopoli*, *Rustchuk*, *Silistria*, *Galatz*, and *Ismail*. Before reaching Ismail the river begins to form a delta, and falls by three chief streams into the Black Sea.

2. Give notes of a lesson on the great cities of Italy, *or* (with a fuller description) on one of them.

NAME.	SITUATION.	DESCRIPTION, ETC.
Naples.	Near the foot of Mt. Vesuvius on the Bay of Naples.	The largest and most populous city of Italy; the city and bay form a scene of the greatest beauty; it is the first maritime city in S. Italy, and the centre of many learned institutions.
Rome.	On the left bank of the Tiber.	Capital of Italy; next to Jerusalem most celebrated city in the world; unrivalled for its architecture; St. Peter's, finest cathedral in the world; Vatican, the Papal Palace.
Turin.	On the Po.	Capital of Piedmont; first city for literary institutions; famous university; near it the Waldensian Valleys.
Milan.	On the Olona, in a beautiful plain between the Adda and Ticino.	Ancient and magnificent city; cathedral of white marble; the centre and emporium of the silk trade of Lombardy.
Palermo.	On the N. coast of Sicily, in a rich valley.	Several fine squares; climate one of the finest in Europe; 1898, Sicilian Vespers, a dreadful massacre of the French.
Genoa.	On G. of Genoa; N. of Italy.	Beautifully situated; important commercial city; manufs. velvets, silk, jewellery, etc.; Columbus born here.
Florence.	On the Arno.	Surrounded by beautiful scenery; university; literary and scientific institutions; Florentine gallery of models and paintings; Dante and Michael Angelo born here.

3. Describe fully the English lakes, *or* those in North Italy, *or* those in Switzerland.

Illustrate *one* answer by a map. Insert the lines of latitude and longitude.

(*a*) The English lakes are few in number, very small in dimensions, and mostly confined to the Cumbrian Mountains. *Windermere*, the largest of them, is 10½ miles long. *Ullswater* is the second in size, whilst *Bala*, the largest in Wales, is drained by the Dee. The English lakes are celebrated for their beauty, and are visited by a great number of tourists; and famed for containing a species of fresh-water fish called *char*, peculiar to the north-west of England, and greatly prized as a luxury. The other principal lakes are *Bassenthwaite*, *Derwentwater*, *Thirlemere*, *Crummockwater*, *Lowerwater*, *Ennerdale Water*, and *Wastwater* in Cumberland; *Haweswater*, *Grassmere*, and *Rydal*, in Westmoreland; and *Coniston*ewater, in Lancashire.

(*b*) Italy is studded with many beautiful lakes, especially in the basin of the Po, near the foot of the Alps, where lie lakes *Garda*, *Como*, *Maggiore*, *Iseo*, and *Lugano*; the first, 560 square miles, and 227 ft. above the sea, is drained by the Mincio; Iseo by the Oglio; Como by the Adda; Maggiore by the Ticino; and Lugano by the Tresa.

(*c*) The lakes of Switzerland are more numerous in proportion to its size than in any other European country, except Scandinavia and Finland. The two largest are the *Lake of Geneva* and the *Lake Constance*. There are ten in the basin of the Rhine, viz., *Lake Constance*, drained by the Rhine; *Thun* and *Brienz* by the Aar; *Zurich* and *Wallenstadt* by the Limmat; *Zug* and *Lucerne* by the Reuss; *Bienne*, *Neuchâtel*, and *Morat* by the Thiele. The Lake of Geneva is drained by the Rhone; and Maggiore and Lugano by the Ticino, an affluent of the Po. The last two are partly in Italy.

History.

1. Write out the list of our sovereigns from Canute to William Rufus with dates.

Canute	ascended	the throne	A.D. 1017
Harold	,,	,,	1036
Hardicanute	,,	,,	1039
Edward (Confessor)	,,	,,	1041
Harold II.	,,	,,	1066
William I.	,,	,,	1066
William II. (Rufus)	,,	,,	1087

2. Who was the first queen who reigned in England? Give the date of her accession and the names and dates of the two next sovereigns.

The first queen who reigned in England was Mary I., who ascended the throne A.D. 1553

Her successors were	Elizabeth	,,	,,	,,	1558
	James I.	,,	,,	,,	1603

3. Name the sovereigns who have reigned since 1714, with their dates of accession.

George I.	began to reign	A.D.	1714
George II.	,,	,,	1727
George III.	,,	,,	1760
George IV.	,,	,,	1820
William IV.	,,	,,	1830
Victoria	,,	,,	1837

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Alexandria*.

Write, in small hand, as a specimen of copy-setting, *Great Jupiter be praised: Lucius is taken.*

Composition.

Write from memory the substance of the passage read to you by the Inspector.

(*For the Examiner.*)

The passage should be read *once* distinctly, and then the substance of it is to be written down from memory by the Pupil Teacher.

(*For Pupil Teachers at the End of the First Year.*)

Veii lay about ten miles from Rome, between two small streams which meet a little below the city and run down into the Tiber. Insignificant in point of size, these little streams, however, like those of the Plain of Rome generally, are edged by precipitous rocky cliffs, and thus are capable of affording a natural defence to a town built on the tableland above and between them. The space enclosed by the walls of Veii was equal to the extent of early Rome itself; in the magnificence of its public and private buildings Veii is said to have been preferred by the Roman commons to Rome. The fall of Veii marks an important stage in the growth of Roman power.

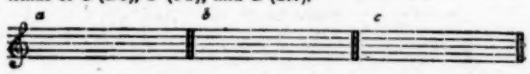
Music.

A quarter of an hour allowed for this paper.

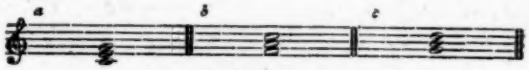
1. What are the chief uses of the bar in music?

1. The chief use of the "bar" is to regulate the accent, by dividing the music into equal portions of time. The end of a piece is shewn by a double bar.

2. What is a *triad*? Write in *a*, *b*, and *c* severally the major triads of C (*Do*), F (*Fa*), and G (*Sol*).



2. A triad is the addition of its *third* and *fifth* to any given note.



3. How many tones and how many semitones are found in the ascending major scale, and what are their places therein?

3. Five tones and two semitones, the latter being found between the third and fourth, and seventh and eighth notes.

SECOND YEAR.

Pupil Teachers at end of Second Year.

Three hours and a half allowed for this Paper.

Arithmetic.

MALES.

1. Find the simple interest on £650 10s. from March 10th to August 3rd, at 3¾ per cent. per annum.

No. of days from March 10th to August 3rd = 146

$$\text{Interest} = £650\tfrac{1}{2} \times \tfrac{146}{365} \times \frac{3\frac{3}{4}}{100}$$
$$= £\frac{1301 \times 146 \times 15}{2 \times 365 \times 400}$$
$$= £\frac{29199}{4000} = £9\ 15\text{s.}\ 1\tfrac{1}{2}\text{d.} \quad \text{Ans.}$$

2. What sum of money must be lent so that the principal and interest at the end of 9 months will amount to £361 16s. 3d., the rate of interest being 4½ per cent. per annum?

Interest of £100 for ¾ year at 4½ per cent. = £3⅜
Amount ,, ,, ,, = £103⅜

£103 7s. 6d. : £361 16s. 3d. :: £100 : ?
or or
24,810d. 86,835d.

$$\frac{£100 \times 86{,}835}{24{,}810} = £350. \quad \text{Ans.}$$

3. What is the principal if the compound interest on it for 2 years at 5 per cent. per annum be £261 7s. 6d.?

Compound interest on £100 for 2 years at 5 p.c. = £10 5s.

∴ £10¼ : £261¼ :: £100 : principal required

$$\frac{£100 \times 2091 \times 4}{8 \times 41} = £2550. \quad \text{Ans.}$$

4. 64 children were examined, and 56 passed in reading, 60 in writing, and 54 in arithmetic; find the percentage of passes in each subject, and the average percentage to two decimal places.

$$64 : \left\{\begin{matrix}56\\60\\54\end{matrix}\right\} :: 100 : \left\{\begin{matrix}87{\cdot}5 \text{ p.c. in reading.} & \text{Ans.}\\ 93{\cdot}75 \text{ ,, writing.} & \text{Ans.}\\ 84{\cdot}375 \text{ ,, arithmetic.} & \text{Ans.}\end{matrix}\right.$$

192 possible passes : 100 possible passes :: 170 total passes : ?

$$\frac{170 \times 100}{192} = 88\cdot54 \text{ average per cent.}$$

5. A man spends 4 per cent. of his money, and then 5 per cent. of what remains; what percentage of his money has he left?

By spending 4 per cent. he has $\frac{96}{100}$ left.
" 5 " of $\frac{96}{100}$ he has $\frac{96}{100}$ of $\frac{96}{100}$ left.
∴ he has $\frac{96}{100}$ of $\frac{96}{100}$ of the whole remaining;

that is, $\frac{91\cdot2}{100}$ or $91\frac{1}{5}$ per cent. Ans.

FEMALES.

1. Find the value of $3\frac{3}{4} - 2\frac{1}{8} + 4\frac{5}{16} + 1\frac{7}{8} - 5\frac{5}{16}$

$$3\tfrac{144}{384} - 2\tfrac{48}{384} + 4\tfrac{120}{384} + 1\tfrac{336}{384} - 5\tfrac{120}{384}$$
$$8\tfrac{648}{384} - 7\tfrac{168}{384} = 1\tfrac{23}{24}. \text{ Ans.}$$

2. Find the value of $23\frac{7}{11}$ of 6 cwt. 2 qrs. $13\frac{5}{12}$ lbs.

$\frac{252}{11}$ of $741\frac{5}{12}$ lbs.

$$\frac{8897 \text{ lbs.} \times 260}{12 \times 11} = \frac{2312220}{132} \text{ lbs.} = 156 \text{ cwt. } 1 \text{ qr. } 24\tfrac{12}{33} \text{ lb} \quad \text{Ans.}$$

3. Simplify $3\frac{1}{7}$ of $6\frac{3}{5}$ of $4\frac{5}{16}$ of $\frac{1}{13}$ of £3 8s. 7d.

$$\frac{£3\ 8s.\ 7d. \times 25 \times 33 \times 49 \times 15}{7 \times 5 \times 10 \times 64} =$$
$$£3\ 8s.\ 7d. \times \tfrac{693}{64} = £90\ 0s.\ 3\tfrac{3}{4}d. \quad \text{Ans.}$$

4. How long will it take to fill $\frac{17}{25}$ of a reservoir, when the whole requires 6 hours 10 minutes?

The whole will be filled in $\frac{25}{17}$ of 6 hrs. 10 min. =

$$\frac{6 \text{ hrs. } 10 \text{ min.} \times 25}{17} = 9 \text{ hrs. } 4 \text{ min. } 7\tfrac{1}{17} \text{ sec.}$$

1 : $\frac{17}{25}$ :: 6½ hrs. : time

$$\frac{37 \text{ hrs.} \times 17}{6 \times 25} = \frac{629}{150} \text{ hrs.} = 4 \text{ hrs. } 11 \text{ min. } 36 \text{ sec.} \quad \text{Ans.}$$

Grammar.

1. 'Howbeit I know, if ancient prophecies
Have erred not, that I march to meet my doom;
Thou hast not made my life so sweet to me,
That I, the king, should greatly care to live;
For thou hast spoilt the purpose of my life.'

TENNYSON.

(*a*) Point out the conjunctions in the above, and assign each to its proper class.
(*b*) Point out all the participles and infinitive moods in the above.
(*c*) Show which is the noun sentence in the above and analyse it.

(*a*) '*Howbeit*'—subord. concessive conj.
'*if*'—subord. hypothetical conj.
'*that*'—subord. simple conj.
'*that*' " " "
'*for*' " causal "

(*b*) '*Erred*'—past part., forming part of a compound tense.
'*to meet*'—infinitive, gov. by 'march.'
'*made*'—past part., forming part of a compound tense.
'*care*'—infinitive after 'should.'
'*to live*'— " gov. by 'care.'
'*spoilt*'—past part., forming part of a comp. tense.

(*c*) 'That I march to meet my doom' is the noun sentence, forming the object of 'I know.'
(1) '*that*' ... ... connective.
(2) '*I*' ... ... subject.
(3) '*march*' ... ... predicate.
(4) '*to meet my doom*' completion of predicate.

2. Is there any exception to the rule that conjunctions do not require an objective case after them? If there is, give an example.

'Than' forms an exception to the rule that conjunctions do not require an objective case, for 'whom' is preceded by 'than' in such examples, as, 'Gambetta is dead, than whom a more patriotic Frenchman never lived.'

Geography.

Answer two Questions.

1. Describe fully the journey of a traveller from Paris to Vienna, and then down the Danube to its mouth.

See answer under First Year.

2. Give full notes of a lesson on New Zealand, its physical features, chief towns, productions, and native inhabitants. Illustrate by a map. Insert the lines of latitude and longitude.

Notes of a Lesson on 'NEW ZEALAND.

I PHYSICAL FEATURES AND PRODUCTIONS.—Antipodes of England (explain *antipodes*), consists of three islands—compare with United Kingdom—North Island somewhat larger than Ireland—South Island somewhat larger than England and Wales—Stewart Island about the size of Westmoreland—from position the climate is mild, and, on account of surrounding ocean, the temperature is of an even character—North Island has perpetual spring—which genial temperature makes it a pleasant residence—South Island traversed by a range of mountains called Alps, which arrest the moisture of the westerly winds.—The forests abound in good timber, and owing to the greenness of the tree-ferns, are extremely beautiful. Gold is found on the western side of the mountains—iron in the west of North Island—hot-water springs are found here and there in volcanic regions—coal and copper in many parts of both islands—flax is grown and exported—chief exports, however, are gold and wool—New Zealand has no large rivers—the largest and most thriving settlement is a Scotch one, whose capital is Dunedin, at the head of a fine harbour in the south-east of South Island.

II. CHIEF TOWNS.—*Wellington*, on Port Nicholson, capital since 1865; *Auckland*, second town in New Zealand; steam communication with Australia, Sandwich Islands, and San Francisco; *Christchurch*, very thriving, connected with Port Lyttleton by a tunnelled railway; *Dunedin*, the largest city in New Zealand; founded 1848 by Free Church emigrants; *Nelson*, on north coast of South Island, has some manufactures; *Taranaki*, founded by emigrants from Devon and Cornwall.

III.—INHABITANTS.—The aborigines, or original natives of New Zealand, are called Maories, and are of the Malay race. They are more intelligent and capable of civilization than any other race of savages—have fixed dwellings—cultivate the land—learn trades—and embrace the Christian religion. When Captain Cook visited the Islands about a hundred years ago they thought that his ship was a bird of unusual size, and admired its sails, which they took to be wings.

History.

Two hours and a half allowed.

1. From what district did the Saxons originally come? Give the names of their three tribes, and say which part of Britain each occupied.

The three tribes of Saxons were Jutes, Angles, and Saxons. The Jutes came from what is now called Jutland; the others came from the districts lying round the mouths of the rivers Elbe, Weser, Ems, and Rhine.

About 450 A.D., the Jutes landed and conquered the *Kingdom of Kent*, containing the present County of Kent, south of Hampshire, and Isle of Wight.

In 476 a body of Saxons founded a *Kingdom of Sussex*, consisting of Sussex and a large part of Surrey; in 495 they founded *Wessex*, including all south of the Thames, and west of Sussex, except Devon and Cornwall; in 527 other Saxons conquered Middlesex and Essex, calling the kingdom '*Essex*.'

During the sixth century the Angles founded *E. Anglia*, consisting of Norfolk and Suffolk; about 547 a body of Angles formed the *Kingdom of Northumbria*, including the territory north of the Humber; and Anglican chiefs also conquered the centre of England about 626, and named the kingdom '*Mercia*.'

2. After the battle of Hastings how did the Conqueror deal with the land of the country? How came the king to get support from both English and Normans?

After the battle of Hastings William declared the land to be confiscated to the Crown. He shared the conquered lands among his deserving chiefs; the lands, honours, and offices of the former rulers became the property of the Normans, and for a century to come the conquered English were to be plundered, oppressed, and despised. The Norman hold upon the land was made sure by the erection of strong stone castles, which not only enabled their owners to oppress the subject, but even to defy the monarch.

William conciliated the English by retaining the Saxon laws, and granting a new charter to the citizens of London, and allowing a good deal of land to remain for a while in the hands of the English owners.

3. Describe the origin and the object of the Crusades.

In 1095 A.D. a council of the Church held at Clermont resolved that an attempt should be made to rescue the city of Jerusalem from the hands of Mohammedan infidels, called Saracens, who held possession of it. A religious enthusiast, Peter the Hermit, journeyed through Europe, and called on the nobles, knights, and kings to deliver the sepulchre of Christ from the infidels. In 1096 the first expedition was formed, and which, from the *cross* sewn upon the dress of those who joined it, has been called a *Crusade*.

Composition.

Write full notes from a lesson on *Paper*.

THINGS TO BE SEEN.—*Calico—linen—straw—wood—hemp—tow—esparto—soda—slaked lime—chloride of lime—pieces of felt—blotting-paper—size—resin—alum—various kinds of paper.*

WHAT IT IS.—A piece of paper is a sheet of fibres matted together, and being such can be made out of almost anything which has fibres—materials generally used being cotton and linen rags, straw, wood, tow, esparto-grass—moss lately discovered in Sweden, and even the peat of Ireland. (*Show to class articles as named.*)

PROCESS OF MANUFACTURE.—Dry rags cleaned—seams undone—sorted—rubbed on a metal sieve—boiled in water with soda and slaked lime—torn to pieces—bleached if necessary with chloride of lime—ground to a pulp—which is kept well stirred in a vat.

(*a*) *Hand-made paper.*—A sieve dipped into the pulp and brought up again—quite level—water drains off and leaves a sheet of pulp—thickness of paper depends on depth of sieve—then water is drained off and sheet is laid on one piece of felt and another piece of felt over the paper, then another sheet of paper, then another piece of felt, and so on—the whole pile being firmly pressed to squeeze out the water—this makes blotting paper, which may be sized—and smoothed between smooth sheets of copper—which makes the paper easier to write on.

(*b*) *Machine-made paper.* (*Show drawing of mill.*)—Same process gone through as for hand-made paper, but work goes on at a greater rate—pulp flows over the edge of the trough as wide as the paper is to be—falls upon a wire-cloth—which passes round two rollers, carrying the pulp with it—pulp thus partly dried—passes over boxes without tops, from which the air has been drawn, and the water from the pulp follows it—the sheet next passes between two rollers covered with felt—along a felt band—between two smooth metal rollers, and at last over several smooth hot rollers warmed with steam—then it may be wound upon a reel. For paper, such as wall and packing paper, a size is made with resin, soda, and alum—cut into sheets for market.

USES.—Many kinds of paper for books, newspapers, magazines; writing papers, note, letter, foolscap, etc.; packing. *Papier-maché* is shreds of paper softened, pressed in moulds, dried, japanned, gilded and polished; used for tables, work boxes, trays, dressing-cases, etc.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Alexandria*.

Write, in small hand, as a specimen of copy-setting, *Great Jupiter be praised: Lucina is taken.*

Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

1. Define *equilateral triangle*, *finite straight line*, circle.

To describe an equilateral triangle upon a given finite straight line.

An equilateral triangle is one that has three equal sides.

A finite straight line is one which is limited as to its length.

A circle is a plane figure contained by one line, which is called the circumference, and is such that all straight lines drawn from a certain point within the figure to the circumference are equal. That point is called the centre.

Prop. 1, Book I.

2. If two straight lines cut one another, the vertical, or opposite angles shall be equal.

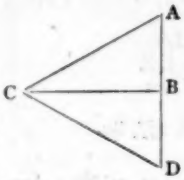
State and prove the corollaries.

Prop. 15, Book I.

3. ABC is a triangle right-angled at B, and the angle A is double the angle C. Show that BC is less than twice AB.

(At C make ∠ BCD = ∠ ACB; produce AB to meet CD at D, etc.)

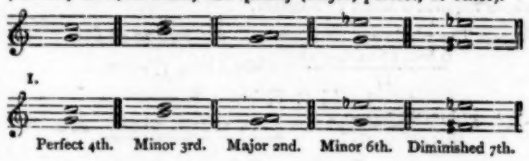
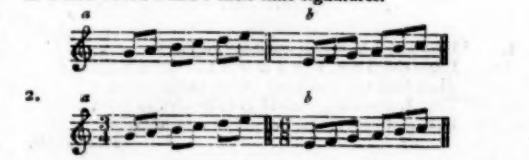
If ∠ BCD be made equal to ∠ ACB, then ACD is an equilateral triangle, each of its angles being equal to two-thirds of a right angle. ∠ A = two-thirds of a right angle, being double of ∠ ACB, and ∠ ACD = ∠ BAC, ∴ ∠ D is the complement of two right angles and also = two-thirds of a right angle.

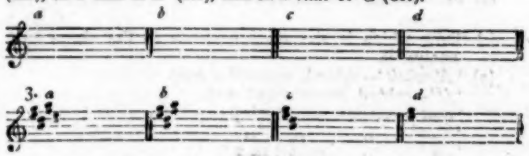


Now the side AD equals AC, and AC is greater than BC, being opposite the right angle, therefore AD, that is, twice AB, is greater than CB (BD by I. 26 being equal to AB). BC is ∴ less than twice AB.—Q. E. D.

Music.

A quarter of an hour allowed for this paper.

1. Write under each of the following intervals its name (second, third, or other) and quality (major, perfect, or other).

2. Place before *a* and *b* their time signatures.

3. Write in *a* the scale signature of E (*Mi*), in *b* that of A (*La*), in *c* that of D (*Re*), and in *d* that of G (*Sol*).



THIRD YEAR.

Pupil Teachers at end of Third Year, *if apprenticed on, or after, 1st May,* 1878; **and Pupil Teachers at end of Fourth Year,** *if apprenticed before that date.*

Three hours and a half allowed

Arithmetic.

MALES.

1. A man buys ale at 60s. a barrel, and retails it at 1½d. a glass, which is ⅓ of half-a-pint; what percentage does he gain on his outlay?

1 barrel = 36 gals. = 576 half-pints.

⅓ half-pt. : 576 half-pts. :: 1½d. : selling price of barrel.

$$\frac{3\text{d.} \times 576 \times 3}{2 \quad \times 2} = 1296\text{d.} = 108\text{s.}$$

108s. − 60 = profit on price of barrel = 48s.
∴ 60s. : 100s. :: 48s. : gain per cent.
$\frac{48 \times 100}{60}$ = 80 p. c. Ans.

2. A woman buys eggs at 9d. per dozen, and sells them at 7 for 6d.; what does she gain per cent?

Selling price of each = $\frac{1}{7}$d. or $\frac{12}{84}$
Buying " " = $\frac{1}{9}$d. or $\frac{12}{108}$
gain on $\frac{1}{9}$d. = $\frac{1}{252}$
$\frac{1}{9}$d. : 100d. :: $\frac{1}{252}$d. : gain p. c.
$\frac{3 \times 100 \times 4}{28 \times 3}$ = 14$\frac{2}{7}$ p. c. Ans.

3. If by investing £6685 in railway stock at 119$\frac{1}{2}$ I get £238 dividend, what percentage do the stocks pay?

£6685 : £119$\frac{1}{2}$ :: £238 : percentage.
$\frac{£238 \times 955}{6685 \times 8}$ = 4$\frac{1}{4}$ per cent. Ans.

4. A broker who charges $\frac{1}{4}$ per cent. commission for each transaction sells for me £2,000 from the 3 per cents. at 97$\frac{1}{2}$, and re-invests the money in railway debentures at 129$\frac{1}{2}$; what amount of debentures can he buy?

3 per cents. bring 97$\frac{1}{2}$ per cent.
Railway debentures cost 130 per cent.
∴ 130 : 97$\frac{1}{2}$ :: £2000 : amount of debentures.
$\frac{£2000 \times 195}{130 \times 2}$ = £1500. Ans.

5. The true discount on a bill due 9 months hence, interest being at the rate of 4 per cent. per annum, is £6 15s.; what is the amount of the bill?

Int. of £100 for $\frac{3}{4}$ yr. at 4 per cent. = £3
Amount " " " = £103
True discount on £103 for 9 months = 3
∴ £3 : £6 15s. :: £103 : Amount required.
$\frac{£103 \times 135}{3 \times 20}$ = £$\frac{927}{4}$ = £231 15s. Ans.

FEMALES.

1. Divide 29·4 by ·007, and ·00015 by ·012.

·007)29·4 ·012)·00015
4200. Ans. ·0125. Ans.

2. Multiply 5 cwt. 2 qrs. 24 lbs. by 1·8375.

(*a*) 5 cwt. 2 qrs. 24 lbs. = 5$\frac{3}{4}$ cwt.
(*b*) 1·8375 = 1$\frac{147}{800}$ = $\frac{147}{80}$
∴ $\frac{40 \text{ cwt.} \times 147}{7 \times 80}$ = 10$\frac{1}{2}$ cwt. Ans.

3. Find the value of 2·1590 of 7 days 5 hrs. 30 mins.

(*a*) 7 days 5 hrs. 30 min. = 173$\frac{1}{2}$ hrs.
(*b*) 2·1590 = 2$\frac{159}{1000}$ = 2$\frac{159}{1000}$
∴ $\frac{347 \text{ hrs.} \times 95}{2 \times 44}$ = $\frac{32965}{88}$ hrs. = 15 days 14 hrs. 36$\frac{2}{11}$ min. Ans.

4. Express 3 miles 6 fur. 2 po. 2 yds. 2 ft. 3 in. as the decimal of 7 miles 4 fur. That is, to the decimal of 60 fur.

12 | 3 in.
3 | 2·25 ft.
5·5 | 2·75 yds.
40 | 2·5 po.
60 | 30·0625 fur.
·5010416. Ans.

Grammar.

1. 'God gives us love. Something to love
He lends us; but when love is grown
To ripeness, that on which it throve
Falls off, and love is left alone.'

TENNYSON.

(*a*) Paraphrase the above passage.
(*b*) Point out and analyse any adjective and adverbial sentences that occur in it.
(*c*) Sometimes the infinitive is used as the complement to the verb. Point out an instance of this in the above and give other examples.

(*a*) Love is a gift from God, who gives us one upon whom we place our affections; but in course of time He takes that one away, and leaves only the remembrance of him or her who has passed away.
(*b*)
(1) '*When love is grown to ripeness*,' subord. adv. sentence.
'*When*' ..... connective.
'*love*' ..... subject.
'*is grown*' ..... predicate.
'*to ripeness*' ..... extension of pred.
(2) '*On which it throve*,' adj. sent. qual. 'that.'
'*it*' ..... subject.
'*throve*' ..... predicate.
'*on which*' ..... compl. of pred.
(*c*) 'To love' is the complement of the verb 'lends.'
Other examples are:—He told us *to flee*; you ought *to go*; the ship seemed *to be sinking* fast.

2. Parse each word in the following:—

'The sight of means to do ill deeds
Makes ill deeds done.'

'*The*'—def. art., or dist. adj., limiting 'sight.'
'*sight*'—abstr. noun, neut., sing., nom., subj. of 'makes.'
'*of*'—prep., gov. obj. case 'means.'
'*means*'—abstr. noun, neut., sing., or plur., obj. gov. by 'of.'
'*to do*'—irreg. trans. verb, *do, did, done*, infin., pres. indef., attrib. to 'means.'
'*ill*'—adj., qual. 'deeds' (comp. *ill, worse, worst*).
'*deeds*'—abstr. noun, neut., plur., obj., gov. by 'to do.'
'*makes*'—irreg. trans. verb, *make, made, made*, indic., pres. indef., 3rd pers., sing., agr. with subj. 'sight.'
'*ill*'—(as before)
'*deeds*'—(as before) obj. gov. by 'makes.'
'*done*'—complete part. of *do, did, done*, forming with (to be) the pres. infin. passive.

3. Give two words compounded with each of the following Latin prepositions, 'sub,' 'in;' and give examples to show how the spelling of the preposition sometimes changes in composition.

With 'sub' are compounded *sub*tract and *suf*fice.
" 'in' " " *in*ject " *ir*resolute.
Ad is changed to *ac, af, ap*; as, *ac*cede, *af*fect, *ap*pend.
Ob " " *oc, of, op*; as, *oc*cur, *of*fend, *op*pose.
Con " " *col, cor, co*; as, *col*lect, *cor*rect, *com*mit.

Geography.

1. Give notes of a first lesson to an upper Standard on the great physical features of Asia. Illustrate by an outline map, and insert the lines of latitude and longitude.

N.B.—*Do not attempt to go fully into details on any point, but give a clear view of the general outline.*

NOTES OF A LESSON ON THE GREAT PHYSICAL FEATURES OF ASIA.

SURFACE.—Asia is a continent of plateaus.—*Great Central Plateau*, bounded on the north by the Altai Mts.—on south by Himalayas—on east by Khingan, Inshan, and Yungling Mts.—and on west by the plateau of Pamir and the hills running north to the Altai system. From this central plateau the continent slopes in all directions—northwards is the plain of Siberia—east, the plain of China—south, Further India and Hindostan—west, Turkestan. South of Turkestan is the plateau of Iran, which includes Afghanistan, Beloochistan, and Persia. To the N.W. of Persia, and south of the Caucasus Mts., is the Plateau of Armenia—westward of Armenia is the Plateau of Asia Minor—the Plateau of Arabia is separated from that of Iran by the valley of the Euphrates and Tigris.

RIVERS.—Rivers numerous and important—generally rising on the edges of the various plateaus—draining the surrounding slopes. On the north of Central Plateau are the Obi, Yenesei, and Lena flowing to the Arctic Ocean; on the east, the Amoor, Hoangho, and Yang-tse-Kiang, which flow into the Pacific; on the south, the Mekon, Meinam, Saluen, and Irrawady in Further India; and the Brahmapootra, Ganges, and Indus in Hindostan. The Tigris and Euphrates drain the valley between the plateaus of Iran and Arabia, unite and flow into the Persian Gulf.

LAKES.—Lakes are numerous in Asia—some very large—such as the Caspian Sea, Sea of Aral, and Lake Baikal—many have no outlets, which renders their waters more or less salt. Lake Victoria on the Plateau of Pamir is said to be the most elevated lake is the world—while the Dead Sea is the most depressed, being 1300 ft. below the level of the Mediterranean—its waters so salt that no animal can live—Lake Urumiyah in Persia is still salter.

2. Say what you know about Constantine, Fez, Coomassie, Ujiji, Gondar, the Victoria Falls, and the River Congo.

Constantine is a city of Algeria in the N. of Africa, situated on a steep rock, and strongly fortified—has many fine remains of Roman architecture—was taken by the French 1847, and is still possessed by them.

Fez is a city of N. Africa, belongs to Morocco, is situated in a beautiful and fertile valley, and has manufactures of woollens and morocco-leather.

Coomassie is the capital of the Kingdom of Ashantee, Upper Guinea, on the West Coast of Africa. It was taken and burnt by the British, under Sir Garnet Wolseley, 1874.

Ujiji is an Arab village on Lake Tanganyika in Central Africa, where Stanley found Livingstone, and relieved him in 1871.

Gondar is the chief town of Abyssinia, N.E. of Lake Dembea—built in volcanic region—is not so important as it used to be.

The Victoria Falls are on the R. Zambesi in S. Africa, and have a fall of 100 ft. into a gorge of basaltic rock.

The River Congo is a great river of W. Africa, which rises in the equatorial lake region, and enters the Atlantic in Lower Guinea. It has different names in different parts of its course, such as the Luapula, Lualaba, etc., and finally Zaire, or Congo. It was explored by Stanley 1876-7, and he proposed to call it the Livingstone. He calculated its length to be at least 2000 miles.

SECOND PAPER.

Two hours and a half allowed.

History.

1. Describe the object and fate of the Invincible Armada.

The 'Spanish Armada' was a mighty naval force collected at Lisbon for the invasion and subjugation of England, which enterprise was undertaken at the instance of Pope Sixtus V. The Armada was composed of 130 ships under the command of the Duke of Medina Sidonia.

The expedition having left Lisbon is May, 1588, was scattered by a storm, and after being refitted, sailed again in July. Lord Howard, assisted by such seamen as Drake, Hawkins, and Frobisher, harassed their unwieldy enemy with the small and easily-managed English vessels. While lying in Calais roads, the sending of eight fire-ships among the foe was the last blow dealt to the Armada by the hand of man. Terror and confusion followed; they fled through the Straits of Dover, the English ships following in hard pursuit, and the chase lasted to the coast of Scotland. The storms finished the ruin of the Spanish force, and only fifty-two half-wrecked vessels re-entered the ports of Spain.

2. Give the date of the Seven Years' War; describe the causes of it, and mention the chief gains to this country.

The Seven Years' War lasted from 1756 to 1763. It arose about the boundaries of the English and French settlements in North America. The French had encroached upon the English colonists; these resisted, and thus the mother countries were, ere long, engaged in hostilities.

By the *Treaty of Paris*, 1763, this country acquired, and has ever since retained Canada, Nova Scotia, Cape Breton Island, Newfoundland, and Prince Edward Island.

3. What led to the Russian War of 1854? Mention the chief engagements of the war.

The ambition of Russia was the immediate cause of the war. The Emperor Nicholas aiming at the possession of Constantinople, and making a pretext of quarrel out of Turkey's treatment of her Christian subjects, in 1853 invaded Turkey. England and France united with Turkey in opposition to the designs of Russia, and towards the close of the war Sardinia sent a contingent.

The chief engagements of the war were:—Battle of the Alma, Inkerman, Balaclava, Siege and Storming of Sebastopol.

Algebra.

MALES.

1. Show that $(5a+4b+3c)^2-(3a+4b+5c)^2=16(a-c)(a+b+c)$; and that $(3x+2y)^3-(2x+3y)^3=(x-y)\{19(x+y)^2-xy\}$.

(a)

$$(5a+4b+3c)^2=25a^2+40ab+16b^2+30ac+24bc+9c^2$$
$$(3a+4b+5c)^2=9a^2+24ab+16b^2+30ac+40bc+25c^2$$
$$\text{Subtracting}=16a^2+16ab-16bc-16c^2$$
$$=16\{(a^2-c^2)+b(a-c)\}$$
$$=16\{(a-c)(a+c)+b(a-c)\}$$
$$=16(a-c)(a+b+c).$$ Q. E. D.

(b)

$$(3x+2y)^3=27x^3+54x^2y+36xy+8y^3$$
$$(2x+3y)^3=8x^3+36x^2y+54xy+27y^3$$
$$\text{Subtracting}=19x^3+18x^2y-18xy-19y^3$$ 1st result.

Again

$$(x+y)\{19(x+y)^2-xy\}=(x+y)(19x^2+38xy+19y^2-xy)$$
$$=19x^3+18x^2y-18xy-19y^3$$ 2nd result.

$\therefore$ 2nd result = 1st result. Q. E. D.

2. Find the G. C. M. of $x^3-48x+7$, $x^2-39x+70$, and $x^3-3x-70$.

Factorizing

$$x^3-48x+7=(x+7)(x^2-7x+1)$$
$$x^3-39x+70=(x+7)(x^2-7x+10)$$
$$x^2-3x-70=(x+7)(x-10)$$

$\therefore$ $x+7$ is the G. C. M. Ans.

3. Solve (1) $\frac{7}{x}+\frac{8}{9x}=1\frac{71}{72}$

(2) $x-\frac{(x+2)^2}{x}=-5$

(1) $\frac{7}{x}+\frac{8}{9x}=\frac{71}{72}$

$\frac{71}{9x}=\frac{71}{72}$

$x=8$. Ans.

(2) $x^2-x^2-4x-4=-5x$

$x^2-x-4x+5x=4$

$x=4$. Ans.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Alexandria.*

Write, in small hand, as a specimen of copy-setting, *Great Jupiter be praised: Lucius is taken.*

Composition.

Write from memory the substance of the passage read to you by the Inspector.

When there was great distress in Rome from a scarcity of corn, the King of the Greeks in Sicily sent ships laden with corn to the Senate; and the Senate resolved to sell the corn to the poor commons lest they should die of hunger. But Coriolanus hated the commons, and he was angry that they had got tribunes to be their leaders, and he said: 'If they want corn, let them show themselves obedient to the burghers as their fathers did, and let them give up their tribunes; then we will let them have corn to eat, and will take care of them.' For this the tribunes accused Coriolanus before the commons; and Coriolanus knew that they would show him no mercy, therefore he staid not for the day of his trial, but fled from Rome and took refuge with the Volscians, Rome's enemies. They and their chief received him kindly, and he lived among them a banished man.

Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

1. All the exterior angles of any rectilineal figure, made by producing the sides successively in the same direction, are together equal to four right angles.

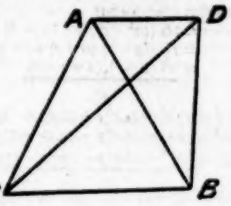
See Corollary to Prop. 32, Bk. I

2. To describe a square upon a given straight line, P. 2.

Prop. 46, Bk. I.

3. Describe a right-angled triangle equal to a given triangle.

Let ABC be the given triangle. Through A draw AD parallel to CB. At B erect BD perp. to CB, meeting AD in D. Join DC. Then BDC is the right-angled triangle required.

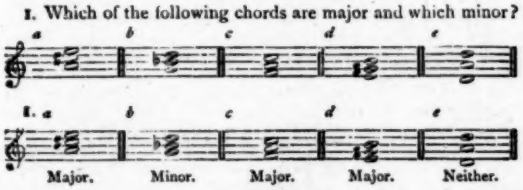


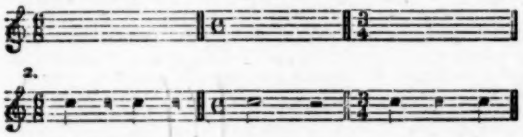
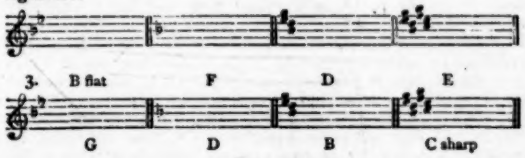
Because the triangles ABC, DBC, are upon the same base BC, and between the same parallels CB, AD, then they are equal to one another; and since DB is perp. to CB, the angle DBC is a right angle, and therefore a right-angled triangle DBC has been described equal to ABC. Q. E. F.

Music.

A quarter of an hour allowed for this paper.

1. Which of the following chords are major and which minor?



2. Write a measure, of notes and rests, in each of the kinds of time indicated by the following signatures.

3. Write over each of the following the name of the major scale, and under each that of the minor scale of which it is the signature.

FOURTH YEAR.

Pupil Teachers at end of Fourth Year, *if apprenticed on, or after,* **1st *May*, 1878; and Pupil Teachers at end of Fifth Year,** *if apprenticed before that date.*

Three hours and a half allowed.

Arithmetic.

MALES.

1. A man, a woman, and a boy do a piece of work for which they get £15 7s.; the man works 9 days, the woman 10, and the boy 12, and the amount of work which they do per day is in the proportion of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$. How much money should each get?

$\frac{1}{2} \times 9 = \frac{9}{2} = \frac{135}{30}$
$\frac{1}{3} \times 10 = \frac{10}{3} = \frac{100}{30}$
$\frac{1}{4} \times 12 = \frac{12}{4} = \frac{72}{30}$
Total shares $= \frac{307}{30}$

$$\therefore 307 : \left\{\begin{matrix}135\\100\\72\end{matrix}\right\} :: £15\ 7s. : \left\{\begin{matrix}£ & s.\\6 & 15 \text{ man's share.}\\5 & 0 \text{ woman's share}\\3 & 12 \text{ boy's }\ ,,\end{matrix}\right.$$

2. What per cent. do I get for my money by investing in railway stock at 134½ paying 4½ per cent., the broker's commission being ¼ per cent.?

Price of stock = £135.
£135 : £100 :: £4½ : ?
$£\frac{9 \times 100}{2 \times 135} = £3\frac{1}{3}$ p.c. Ans.

3. A, B, and C, invest respectively £2,000, £3,000, and £1,680, in business. A gains 10 per cent. and B gains 6 per cent., and the total gain of the three is £338. What is C.'s gain or loss per cent.?

	£
£2000 gains 10 per cent. =	200
£3000 ,, 6 ,, ,, =	180
Total gain	380

∴ C must have lost £(380−338) = £42 on £1680
Hence £1680 : £100 :: £42 : ?
$\frac{42 \times 100}{1680} = 2\frac{1}{2}$ p.c. loss. Ans.

4. A sugar dealer by selling sugar at £27 10s. per ton gains 10 per cent.; what would he gain per cent. or lose by selling it at £24 a ton?

£27½ : £24 :: £110 : Selling price of £100
$£\frac{110 \times 24 \times 2}{55} = £96$
∴ £4 p.c. is lost. Ans.

5. The difference between the true discount and banker's discount on a bill due a year hence is £1; find the amount of the bill, interest being at 5 per cent. per annum.

	£	s.
Banker's discount on £105 = £$\frac{105 \times 5}{100}$ =	5	5
True ,, ,, =	5	0
difference =		5

∴ 5s. : 20s. :: £105 : amount of bill
$\frac{105 \times 20}{5} = £420$. Ans.

FEMALES.

1. A bankrupt's debts amount to £5,145 10s. 8d., and his assets to £1,929 11s. 6d. How much can he pay in the £1? and how much will a creditor lose on a debt of £350?

(*a*) £5,145 10s. 8d., £1,929 11s. 6d.
or or
1234928d. : 463098d. :: £1 : ?
£$\frac{463098}{1234928}$ = 7s. 6d. in the £. Ans.

(*b*) ∴ the loss per £ = 12s. 6d.
£350 times 12½s. = £218 15s. Ans.

2. At an average rate of $\frac{3}{7}$ of a mile per minute a train travels a certain distance in $2\frac{1}{2}\frac{1}{4}$ hours. How long would it take at the rate of ⅘ of a mile per minute?

⅘ ml. : $\frac{3}{7}$ ml. :: $2\frac{1}{2}\frac{1}{4}$ hrs. : ?
$\frac{55 \text{ hrs.} \times 8 \times 9}{24 \times 15 \times 5} = 2$ hrs. 12 min. Ans.

3. If 3 labourers earn £3 7s. 6d. in 10 days, how much will 7 labourers earn in 13 days at the same rate?

$\left.\begin{matrix}3 \text{ lab.} : 7 \text{ lab.}\\10 \text{ days} : 13 \text{ days}\end{matrix}\right\} :: £3\frac{1}{2} : ?$
$£\frac{27 \times 7 \times 13}{8 \times 3 \times 10} = £10\ 4s.\ 9d.$ Ans.

4. Find the principal which will amount to £748 2s. 6d. in 3½ years at 4 per cent.

Amount of £100 for 3½ years at 4 p.c. = £114.
£114 : £748½ :: £100 : ?
$\frac{£100 \times 5985}{114 \times 8} = £\frac{598,500}{912} = £656\ 5s.$ Ans.

Grammar.

1. 'The way of the slothful is *as* an hedge of thorns. Here is *lively represented how* laborious sloth proveth in the end; *for* when things are deferred *till* the last instant, and nothing prepared beforehand, *every* step findeth a brier or an impediment, *which* catcheth or stoppeth.'—BACON. *Advancement of Learning.*

(a) What difference do you notice between the language of the above and the language of the present day, and are you acquainted with any book in which the same kind of difference is to be noticed?

(b) Parse the words in italics.

(c) One sentence sometimes serves as a kind of subject or nominative to another sentence. Give an example of this from the above, and analyse the sentence referred to.

(d) Point out the principal sentences in the above, and the subject of each principal sentence.

(a) The above passage differs from the language of the present day in idiom, style, and the meaning of words. We would say for 'as an hedge of thorns,' '*like* a hedge of thorns;' for 'lively,' we say 'in a lively manner;' 'proves,' 'finds,' 'catches,' 'stops,' instead of the verb ending in *eth;* and for 'every step findeth a brier or an impediment which catcheth or stoppeth,' we would say, 'at every step it finds a brier or an impediment which catches or stops it.' Modern English would make the arrangement much less stiff, more simple and clear.

Shakespeare wrote in the same style, and what is called the Authorised Version of the Bible differs in a similar way from the English of the present day.

(b) *As*—conj. subord., joining 'an hedge of thorns (is)' with 'the way of the slothful is.'
lively—adv., mod. 'is represented.'
represented—complete part., qual. 'how laborious sloth proveth in the end.'
how—adv. of degree, mod. 'laborious.'
for—co-ord. conj., joining the two sentences, 'Here is lively,' etc., and 'when things are deferred...stoppeth.'
till—prep., gov. obj. case 'instant.'
every—distrib. adj., qual. 'step.'
which—simple rel., referring to 'brier' or 'impediment,' neut., 3rd pers. sing., nom., subj. of 'catcheth.'

(c) 'Here is lively represented how laborious sloth proveth in the end.'

'How laborious sloth proveth in the end'	...	Subject.
'is represented'	...	Predicate.
'lively'	...	Extension (manner).
'here'	...	,, (place).

(d) 1st principal sentence: 'The way of the slothful is as an hedge of thorns.' Subject: 'The way of the slothful.'
2nd principal sentence: 'Here is lively represented how laborious sloth proveth in the end.' Subject: 'How laborious sloth proveth in the end.'
3rd principal sentence: 'Every step findeth a brier or an impediment.' Subject: 'Every step.'

2. Which element in our language—the Anglo-Saxon or the Latin—has much in common with modern German? Quote some nouns of Anglo-Saxon origin.

The Anglo-Saxon has much in common with modern German, because modern English has been defined as a 'member of the Low Germanic divisions of the Teutonic branch of the Gothic stock of the Indo-European tribe of languages.' To the Low German belong the five following tongues:—(1) Old Saxon, (2) Anglo-Saxon, (3) Frisian, (4) Dutch, (5) Modern English.

The following nouns are of A.S. origin:—Goodness, length, kingdom, ear, father, bishopric, queen, sun, star, moon, stream, book, day, night, etc., etc.

Geography.

1. Give notes of a lesson on the Rocky Mountains, the rivers which rise in them, and the country on each side of them.

Illustrate by a map, and insert the lines of latitude and longitude.

Notes on the Rocky Mountains.

I. THE ROCKY MOUNTAINS.—Rocky Mts. extend from the Arctic Ocean south to the 30th parallel—in the extreme north these mountains are from 1000 to 2000 ft. high—chain increases in height as it goes south, till it reaches 7000 ft.—Pacific Railway crosses a pass 8400 ft. high—Mt. Brown, in British America, reaches 15,900 ft., the highest summit in the whole chain—Mt. Hooker and Mt. Murchison are not much lower—in the U.S. Fremont's Peak and Lough Peak reach 13,500 ft.

II. THE COUNTRY ON EACH SIDE OF THE ROCKY MTS.—To the east of the Rocky Mts. extends the great plain of N. America, stretching from the Arctic to the Gulf of Mexico—on the west is a broad stretch of high land, crossed by numerous mountain ranges—in the extreme north is the Valley of Yukon—in British Columbia the land descends by terraces to the sea, each terrace being supported by a mountain range—further south is the broad plateau of Utah, extending between the Rocky Mts.—the great plain extends eastward from the Rocky Mts. to the Alleghany, and covers an area of 3,250,000 square miles.

III. THE RIVERS RISING IN THE ROCKY MTS.—The Rocky Mts. separate the basins of the Colville, Youkon, Frazer, Columbia, and Rio Colorado on the west from those of the Mackenzie, Saskatchewan, Missouri, Arkansas, and the Rio del Norte.

2. Describe fully Mexico and Peru, and say what you know about their conquest by Europeans.

Mexico is about 1300 miles long, its breadth varies from 140 to 700 miles, and its area is 742,000 square miles. The country is for the most part a plateau or table-land, varying from 6000 to 8000 ft. above the sea. The climate in the more elevated parts is mild and genial; in the maritime districts and the low plains it is hot and unhealthy. The soil is extremely fertile, and most European grains and fruits, maize, cocoa, coffee, sugar, cotton, indigo, etc., are abundantly produced. Immense herds of cattle and sheep, both tame and wild, are fed in the northern prairies. The cochineal insect is found in great abundance, and is one of the valuable articles of export. The minerals found are gold, silver, quicksilver, copper, iron, tin, and lead. There are no roads fit for wheeled vehicles, and mules are the only beasts of burden.

In 1521 the dominion of the Aztecs was overthrown by the Spaniards under Cortez, and subsequently Spain extended her authority in this quarter, not only over the whole of what now forms the Republic of Mexico, but also over all the territory from Texas to Upper California now belonging to the United States. This territory remained subject to Spain till the present century, but in 1810 a series of revolutionary movements began, which terminated in 1824, and resulted in the adoption of a republican constitution.

Peru is traversed throughout its whole extent by two lofty parallel ranges of the Andes, dividing the country into three physical regions, namely, (1) the Western, or Coast Region, 1500 miles in length and 60 miles in breadth, extending from the Pacific to the base of the Andes; (2) the Central Region, between the crests of the two Cordilleras, consisting of a plateau 12,000 ft. high, with numerous towns and villages; and (3) the Eastern Region, consisting of immense plains, covered with vast forests, which extend up the mountain-sides, and containing the head-waters of the Amazon. Between the Pacific and the Andes is an arid, rainless, barren district, the want of rain being partly compensated for by a moist fog, called the *garua*. The Central Plateau is mild and salubrious, while the Eastern Region is hot and humid. Of the vegetable products, the cinchona or Peruvian bark is one of the most important. The animals include the llama, used as a beast of burden, and the alpaca, useful for its wool. Mules are most employed for travelling. The minerals of Peru, including the precious metals, are the chief source of wealth; but the mines are not sufficiently worked, for want of proper machinery, roads, and other means of transport. Guano is exported in great quantities, especially from the Chincha Islands.

In 1532 the dominion of the Incas, as the ruling classes were called, was overthrown by the Spaniards under Pizarro. From that time till 1832 Peru was subject to Spain, and a Spanish viceroy had his seat at Lima.

SECOND PAPER.

Two hours and a-half allowed.

History.

1. What were the Wars of the Roses? Give names and dates of the chief battles, and show the victorious party in each of them.

The Wars of the Roses—so called from the badges of the contending parties—was a civil contest, that lasted from 1455 to 1485, between the Lancastrians and Yorkists. The following is a list of the chief battles:—

St. Albans (1st),	fought	1455;	York victorious.
Bloreheath	,,	1459;	York ,,
Northampton	,,	1460;	York ,,
Wakefield	,,	1460;	Lancaster ,,
Mortimer's Cross	,,	1461;	York ,,
St. Albans (2nd)	,,	1461;	Lancaster ,,
Towton	,,	1461;	York ,,
Hedgeley Moor	,,	1464;	York ,,
Hexham	,,	1464;	York ,,
Barnet	,,	1471;	York ,,
Tewkesbury	,,	1471;	York ,,
Bosworth	,,	1485;	Lancaster ,,

2. What can you tell of monopolies in the reign of Elizabeth?

In the year 1601, in the reign of Elizabeth, a strong stand was made by Parliament against the abuse of *monopolies*, or patents granted by the Crown for the exclusive sale of various articles of trade. In this way favourites, to whom monopolies were granted, were enriched, and the people suffered from the high prices charged by the privileged dealers for such necessary things as salt, oil, vinegar, lead, paper, iron, leather, and glass. The queen met the remonstrances of Parliament with thanks for drawing her attention to the matters of complaint, and with a promise for the abolition of the same.

3. How came King Charles I. to be put upon his trial? By whom was he tried, and upon what charges?

In 1649 the military leaders of the Independent faction caused the passing of a vote which declared it high treason for a king of England to levy war against his Parliament, and a 'High Court of Justice' was appointed to try Charles upon that charge. On January 20th he was put upon his trial at Westminster Hall. Of the 150 members of the Court, only seventy attended. Cromwell, Ireton, Harrison, and the chief officers of the army were there. The President was a lawyer named Bradshaw. The king was accused of being a tyrant, traitor, and public enemy, in having tried to set up an unlimited Government, and levied war against the Parliament and people.

Penmanship.

Write, in large hand, as a specimen of copy-setting, the word *Alexandria*.

Write, in small hand, as a specimen of copy-setting, *Great Jupiter be praised: Lucius is taken.*

Composition.

Write a short essay on *Colonies*.

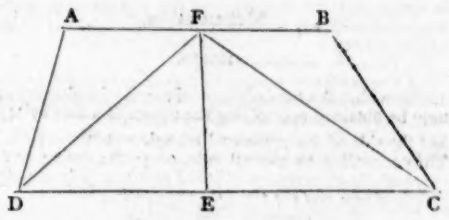
The word Colony has been used in different senses. It was originally applied to a body of people who left their native country and settled in a distant land to inhabit and cultivate it, and who were then said to colonize it. The word is now more often applied to a country that has been colonized than to the people that colonize it. In the time of James I. and Charles I. colonies were frequently called plantations. The inhabitants of a colony are called colonists, a name which they and their descendants retain as long as the colony continues subject to the parent state. A colonist should be distinguished from an emigrant. An emigrant is a person who merely quits one country and settles in another, whether it be a colony or not. Colonies indirectly confer great advantages on the mother country. One of the most valuable is that they furnish a new home for thousands of poor, who find it a hard struggle to live in their own country. Canada, Cape Colony, Australia, and New Zealand are especially adapted for this. Others are valuable as stations for sheltering our fleets, and consequently protect our commerce; such are Heligoland, Gibraltar, Malta, Mauritius. Others are trading stations, in which raw produce from the surrounding countries may be collected, or from which English goods may be distributed to them. Singapore and the settlements in West Africa are of this character. Others are useful as stations or half-way houses, at which ships may call to take in water, or provisions, or coal; for example, Gibraltar, St. Helena, Mauritius, Aden, and the Falkland Islands. Owing to the thinness of population compared with the size of many of our large colonies, labourers are scarce, and there is a great demand for immigrants. The kinds of people most in demand are farm servants of all kinds, artisans, and domestic servants. To meet the great demand for labour, Government has assisted properly qualified persons, and even given free passages to such. Free grants of land have been given to those who paid their own passage out.

Euclid.

MALES.

[All generally understood abbreviations for *words* may be used.]

1. Two opposite sides of a quadrilateral are parallel to one another; show that the line joining their bisections bisects the quadrilateral.



Let the parallel sides AB, DC of the quadrilateral ABCD, be bisected respectively in F and E. Join EF, then EF bisects quadrilateral. Join DF, CF; the triangles DEF, CEF are equal because they are upon equal bases and between the same parallels.

For the same reason the triangles DFA, CFB are equal. Wherefore the whole trapezium AFED is equal to the whole trapezium BFEC. And therefore FE bisects the figure ABCD. Q.E.D.

2. If the square described on QR, a side of the triangle PQR, be equal to the squares described on PQ, PR; the angle QPR is a right angle.

Prop. 48, Bk. I.

3. If a straight line be divided into two equal parts, and also into two unequal parts; the rectangle contained by the unequal parts, together with the square on the line between the points of section, is equal to the square on half the line.

Prop. 5, Bk. II.

Algebra.

MALES.

1. Simplify $\frac{3m}{m^2-n^2} - \frac{m+n}{(m-n)^2} + \frac{3n}{(m+n)^2}$

L.C.M. $=(m^2-n^2)^2$

$$\frac{3m(m^2+n^2)-(m+n)(m+n)^2+3n(m-n)^2}{(m^2-n^2)^2} =$$

$$\frac{3m^3-3mn^2-m^3-3m^2n-3mn^2-n^3+3m^2n-6mn^2+3n^3}{(m^2-n^2)^2} =$$

$$\frac{2m^3-12mn^2-2n^2}{(m^2-n^2)^2} = \frac{2(m^3-6mn^2-n^3)}{(m^2-n^2)^2} \text{ Ans.}$$

2. Find the cube root of $125x^3-525x^2y+735xy^2-343y^3$.

$5x$ | $125x^3-525x^2y+735xy^2-343y^3$ | $5x-7y$

$125x^3$

$(5x)^2\times 3 = 75x^2$ trial divisor | $-525x^2y+735y^2-343y^3$

$\therefore 75x^2+(5x-7y)^2+(-7y)^2$ or $(75x^2-105xy+49y^2)\times -7y$ = $-525xy+735y^2-343y^3$

3. Solve:—

(1) $\frac{3x}{4} - \frac{2y}{3} = 1 = \frac{7x}{18} + \frac{5y}{36}$

(2) $\frac{21}{x+5} + \frac{x}{7} = 6\frac{1}{2}$.

(1) $\frac{3x}{4} - \frac{2y}{3} = 1$; or $9x-8y=12$; or $45x-40y=60$

$\frac{7x}{18} + \frac{5y}{36} = 1$; or $14x+5y=36$; or $112x+40y=288$

By adding $157x=348$

$x=2\frac{34}{157}$. Ans.

$\therefore\ y=\frac{112}{157}$. Ans.

(2) $\frac{21}{x+5}+\frac{x}{7}=6\frac{1}{2}$

clearing fractions $147+x^2+5x=47x+235$

collecting $x^2-42x=88$

completing the square $x^2-42x+441=529$

taking root $x-21=\pm 23$

$x=21\pm 23=\underline{44}$ or $-\underline{2}$. Ans.

Mensuration.

MALES.

1. Show that the area of an equilateral triangle may approximately be obtained multiplying the square of a side by ·433.

Let the side of the equilateral triangle = 1 ft.

Then according to general rule, *area = the square root of half the sum of the three sides multiplied continually by the difference of this half sum and the three sides severally.*

$\therefore$ area $=\sqrt{1\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}}$ sq. ft.

$=\sqrt{\frac{3}{16}}$ sq. ft.

$=\frac{1}{4}$ of $\sqrt{3}$ sq. feet.

area $=\underline{1 \text{ sq. ft.}\times\cdot 433}$...Ans.

1 sq. ft. = sq. of side; wherefore if the side of an equilateral triangle be squared, and multiplied by ·433 the approximate area will be obtained.

2. Find the circumference of a circle which contains 49·73594 square yards.

$\sqrt{\frac{49\cdot 73594}{\cdot 07958}}$ = circumference in yds.

$=\sqrt{625}$ nearly.

$=\underline{25 \text{ yds}}$,, Ans.

Needlework.

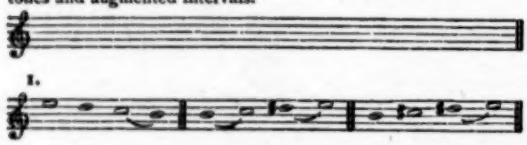
FEMALES.

One hour allowed for this exercise.

Music.

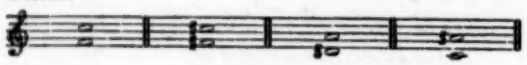
A quarter of an hour allowed for this paper.

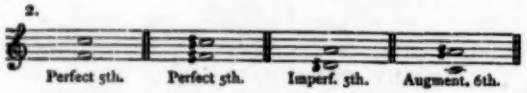
1. Write the upper tetrachord of E (*Mi*) minor, in every form with which you are acquainted. Mark the places of the semitones and augmented intervals.



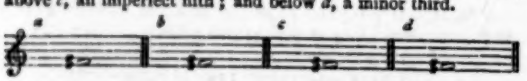
1.

2. Write under each of the following pairs of notes the name and quality (major, perfect, diminished, or other) of the interval it forms.



2.

Perfect 5th. Perfect 5th. Imperf. 5th. Augment. 6th.

3. Write, above *a*, a perfect fifth; above *b*, a major seventh; above *c*, an imperfect fifth; and below *d*, a minor third.



a b c d

3. a b c d

Publications Received.

Arithmetic and Arithmetical Cards—

(1) Ames's Arithmetical Cards. Set 'A.' F. J. Ames.
(2) Blackie's Arithmetic. Standards I. to VII. Blackie and Son.
(3) Ellery's Course of Arithmetic. Standard V. Chambers.
(4) The Economic Test Cards. Standards II. to VI. J. W. Sumner.

Book-keeping—

(1) Practical Book-keeping for Elementary Schools Lewis Hepworth.

Drawing—

(1) Poynter's South Kensington Drawing Books. Parts I. and II. Blackie and Son.
(2) Drawing Copy-Books. Nos. 1, 2, 3, 4, 5, and 6. J. Walker and Co.

English Classics—

(1) 'The Brothers.' By W. Wordsworth. With Life and Notes. W. and R. Chambers.

History—

(1) Yarnold's Lessons in English History. John Heywood.

Latin—

(1) Help for Latin Students. Longmans.

Maps, etc.—

(1) County Atlas of England and Wales. With all Railways and Coach Roads. John Heywood.

Miscellaneous—

(1) What is Religion? W. Stewart and Co.
(2) Myths of Hellas; or, Greek Tales. Longmans.
(3) Select Readings and Recitations. By Baynham. Blackie and Son.
(4) The Family Failing. By Darley Dale. Blackie and Son.
(5) Wise Sayings. By Percy Lund. John Heywood.

Periodicals, Magazines, etc.—

(1) Longmans' Magazine. Nos. 4 and 5. Longmans.
(2) Universal Instructor. Part XXVIII. Ward, Lock, and Co.
(3) Sports and Pastimes. Part XI. Cassell and Co.
(4) Our Little Ones. Vol. III. No. 4. Griffith and Farran.
(5) Why Wooden Heads object to School Boards. An Address by John Forster. John Heywood.

Physiography—

(1) The Elements of Physiography. John Heywood.

Readers—

(1) Geographical Reader. No. 4. Blackie and Son.
(2) Geographical Reader. Standard I. Chambers.
(3) The World at Home. Standard III. Nelson and Sons.
(4) Historical Reader. Book IV. Chambers.

Reading Sheets—

(1) Longmans' Reading Sheets. Longmans.

—o—

We are pleased to notice that, at the November examination for the Customs, held under the Civil Service Commissioners, Mr. H. Y. Humphries, of the School House, Wath, Ripon, was fifth in order of merit, and was also successful in the men clerks' examination held the same month. Mr. P. Walshe, Assistant Master at St. Augustine's School, Liverpool, was twenty-fourth in the Customs, and thirty-third in the Excise examination; and Mr. J. T. McDonald, Assistant Master at St. Francis' School, Liverpool, was forty-fifth in the Customs examination. There were about a thousand competitors in each of the examinations. The successful students named above were prepared solely by Mr. J. Keefe, of the Civil Service Academy, Liverpool, who has secured several other successes im the same examination.

Query Column.

RULES.

1. Each correspondent is restricted to *one question.* We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ **When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.**

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher*, *Pilgrim Street, Ludgate Hill, London, E.C.*

Arithmetic.

1. PUZZLED.—A man buys a farm of 150 acres for £4,624, and, after repairing the buildings, lets it at 30 shillings per acre, thereby getting a return of 4½ per cent. for his money. What sum did he spend in repairs?

Rent = (150 × 30)s. = £225;

Total cost = $£(225 \times \frac{100}{4\frac{1}{2}})$

= £(25 × 200)

= £5,000;

∴ Cost of repairs = £5,000 − £4,624

= £376. Ans.

2. M. E. G. C.—A viaduct consists of 3 series of arches built upon each other, the breadths of the arches in each being respectively 8 yds. 2 ft., 6 yds., and 5 yds.; whenever the piers in all the series are vertically above each other, there occurs a mass of masonry 4 yds. wide; of such there are three; find the length of the viaduct. (*Hamblin Smith.*)

8 yds. 2 ft. = 26 ft.; 6 yds. = 18 ft.; 5 yds. = 15 ft.

L.C.M. of 26, 18, and 15 = 1,170.

1,170 ft. = 390 yds.

∴ Length of viaduct = {(390 × 2) + (4 × 3)} yds.

= (780 + 12) yds.

= 792 yds. Ans.

3. MUDDLE BRAIN.—A merchant sells tea to a tradesman at a profit of 60 per cent., but the tradesman becoming bankrupt, pays only 2s. 6d. in the pound. How much per cent. does the merchant gain or lose by the sale?

The merchant sells tea which cost £100 for £160;

He receives from the bankrupt tradesman

¼ of £160 or £20;

∴ Loss = £100 − £20 = £80;

∴ The merchant loses 80 per cent. Ans.

4. MUDDLE BRAIN.—An estate is bought at 20 years' purchase for £20,000, three-quarters of the purchase money remaining on mortgage at 4 per cent. The cost of repairs averages £180 per annum. What return does the purchaser receive on his investment? (*Mansford.*)

Annual rental = £20,000 ÷ 20

= £1,000;

Interest on mortgage = 4 per cent. on ¾ of £20,000

= 4 per cent. on £15,000

= £600;

Total annual payments = £600 + £180

= £780;

Interest for my outlay of £5,000 = £1,000 − £780

= £220;

∴ Rate of interest = $£(220 \times \frac{100}{5000})$

= 4⅖ per cent. Ans.

5. J. B.—Three persons, A, B, and C, jointly own an estate, their shares being as 4 : 2½ : 1½. A sells half his share to C, and C sells 100 acres to B, and their shares are then equal. How many acres was each entitled to at first? (*Civil Service Examination, November*, 1881.)

4 + 2½ + 1½ = 8.

∴ A's original share = ½ or ½ of the estate,

B's ,, ,, = 2½/8 or 5/16 ,, ,,

C's ,, ,, = 1½/8 or 3/16 ,, ,,

After sale, C has (3/16 + ½ of ½) of the estate − 100 acres

= 7/16 of the estate − 100 acres,

,, ,, , B has 5/16 of the estate + 100 acres;

∴ 7/16 of the estate − 100 acres = 5/16 of the estate + 100 acres

(7/16 − 5/16) of the estate = 200 acres

⅛ of the estate = 200 acres

∴ The estate = 1,600 acres.

∴ A's original share = 800 acres,
B's ,, ,, = 500 ,,
C's ,, ,, = 300 ,,
} Ans.

Note.—Your writing is a good business hand.

6. KATE.—A number is divided by 16, and there is a remainder of 11, by 18 and there is a remainder of 13, and by 20 when there is a remainder of 15; find the number. (*Ricks.*)

The number increased by 5 is exactly divisible by 16, 18, and 20;

∴ Every common multiple of 16, 18, and 20 (decreased by 5) fulfils the conditions;

L.C.M. of 16, 18, 20 = 720;

∴ No. = 715, or 1,435, or 2,155, etc.

7. PYTHAGORAS.—In the Centigrade thermometer the freezing point is zero, and the boiling point is 100°; in Fahrenheit's the freezing point 32°, and the boiling point 212°; what degree C, corresponds to 68° F.?

212° − 32° : 68° − 32° :: 100° : degrees in Centigrade thermometer

180° : 36° :: 100° : ,, ,, ,,

5 20

= 20°. Ans.

8. S. P.—If a person has £10,000 in the 3 per cents. at 85, what sum must he also have in the 3½ per cents. at 90 to produce an income of £1,000?

Income on 1st stock = 3 per cent. on £10,000

= £300;

,, 2nd ,, = £1,000 − £300

= £700;

∴ Amount of 2nd stock = $£700 \times \frac{100}{3\frac{1}{2}}$

= £20,000. Ans.

9. M. G.—If I lay out £1,100 in the 4 per cents. at 92½, at what price should they be sold to gain £100?

£ £ £

115 : 92½ :: 1200 : Price of Stock

12

11)1110

£100 10/11. Ans.

10. T. H. R.—The value of money increases from 4 to 5 per cent.; supposing this to have a corresponding influence on the funds, how much ought the 3 per cent. consols to sink? (*Barnard Smith.*)

Price of 3 per cents. in 1st case $= £100 \times \frac{3}{4}$
$= £75$;
" " 2nd " $= £100 \times \frac{3}{5}$
$= £60$;
∴ The 3 per cent. consols should sink from £75 to £60.

11. G. MANUELL.—A man skates 6 miles with the wind at the rate of 10 miles an hour, and returns in 50 minutes. How much does the wind accelerate or retard his speed?

He skates 6 miles with the wind in $\frac{6}{10}$ of an hour = 36 min.,
" " against " 50 min.;
∴ The wind accelerates or retards his speed
$\frac{1}{2}$ (50 min. − 36 min.)
= 7 min. Ans.

12. STUDENT.—On a piece of work 3 men and 5 boys are employed who do half of it in 6 days. After this one man and one boy are put on, and $\frac{1}{3}$ more is done in 3 days. How many more men must be put on that the whole may be completed in one day more? (*Brooke Smith.*)

3 men and 5 boys can do in 6 days $\frac{1}{2}$ of the work
" " " 1 day $\frac{1}{12}$ "
4 " 6 " " 3 days $\frac{1}{3}$ "
" " " 1 day $\frac{1}{9}$ "
∴ 1 man and 1 boy " " $(\frac{1}{9} - \frac{1}{12})$ "
$= \frac{1}{36}$ "
5 men and 5 boys " " $\frac{4}{36}$ "
∴ 2 men can do in 1 day $(\frac{4}{36} - \frac{1}{12})$ of the work
$= \frac{1}{18}$ of the work;

There remains to be done in 1 day $\{1 - (\frac{1}{2} + \frac{1}{3})\}$ of the work
$= \frac{1}{6}$ of the work;
∴ Part to be done by the additional men in one day
$= \frac{1}{6} - \frac{1}{9}$
$= \frac{1}{18}$;
∴ 2 additional men must be employed.

13. FOLKESTONIAN.—A young clerk is offered a salary of £50 a year, or of £35 a year with an increase of £2 per quarter. Compare the sums total of his earnings at the end of 5 years, according as he adopts one or the other alternative.

This question is not clearly expressed. It evidently means that the salary is increased £8 yearly after the first year.

Salary for 5 years in 2nd case $= £35 \times 5 + £(8 + 16 + 24 + 32)$
$= £175 + £80$
$= £255$;
" " 1st " $= £50 \times 5$
$= £250$;
∴ Difference $= £255 - £250$
$= £5$.

14. GLADSTONE.—A dealer buys 80 tons of coal, and after selling them at 1s. 6d. per sack, finds he has gained £4. Had he sold them at 1s. 4d. per sack, he would have lost £6. Find the cost price per ton, and the weight of a sack of coals.

Difference of (1s. 6d. − 1s. 4d.) per sack gives a difference of (£4 + £6),
Difference of 2d. per sack gives a difference of £10;
∴ No. of sacks $= £10 \div 2d.$
= 1200.

Cost price per ton $= \frac{(1s.\ 6d. \times 1200) - £4}{80}$
$= \frac{£90 - £4}{80}$
$= \frac{£86}{80}$
$= £1\ 1s.\ 6d.$ Ans.

Weight of each sack $= \frac{80 \text{ tons}}{1200}$
$= \frac{1}{15}$ ton
= 1 cwt. 1 qr. 9½ lbs. Ans.

Algebra.

1. INQUISITIVE.—Resolve into factors—

(1) $2x^2 - 12x + 18$;
(2) $x^2 + \frac{p^2 + q^2}{pq}x + 1$.

(*Edinburgh University, Senior Certificate*, 1881.)

(1) $2x^2 - 12x + 18$
$= 2(x^2 - 6x + 9)$
$= 2(x - 3)^2$. Ans.

(2) $x^2 + \frac{p^2 + q^2}{pq}x + 1$
$= (x + \frac{p}{q})(x + \frac{q}{p})$. Ans.

2. SENEX.—An officer can form his men into a hollow square 4 deep, and also into a hollow square 8 deep; the front in the latter formation contains 16 men fewer than in the former formation; find the number of men. (*Todhunter.*)

Let x = No. of men in side of first square,
Then, $x - 16$ = " " " second square;
No. of men in first square $= (x - 4) \times 4 \times 4$
$= 16(x - 4)$;
" " second " $= (x - 16 - 8) \times 8 \times 4$
$= 32(x - 24)$;
$\therefore 32(x - 24) = 16(x - 4)$
$2(x - 24) = x - 4$
$2x - 48 = x - 4$
$\therefore x = 44$.
No. of men $= 16(x - 4)$
$= 16(44 - 4)$
$= 640$. Ans.

3. CLEATOR.—Solve:—

$x^2 + 2x + 5 = \frac{300}{x^2 + 2x}$. (*Scholarship*, 1878.)

$(x^2 + 2x)^2 + 5(x^2 + 2x) = 300$
$(x^2 + 2x)^2 + 5(x^2 + 2x) + (\frac{5}{2})^2 = 300 + \frac{25}{4}$
$= \frac{1225}{4}$
$x^2 + 2x + \frac{5}{2} = \frac{35}{2}$
$x^2 + 2x = \frac{35}{2} - \frac{5}{2}$
$= 15$
$x^2 + 2x + 1 = 15 + 1$
$= 16$
$x + 1 = \pm 4$
$x = \pm 4 - 1$
$\therefore x = 3$, or -5.

4. SABDEN.—Two passengers have together 5 cwt. of luggage, and are charged for the excess above the weight allowed 5s. 2d. and 9s. 10d. respectively; if the luggage had all belonged to one of them, he would have been charged 19s. 2d. Find how much luggage each passenger is allowed without charge.

Let x = quantity allowed in lbs.,
And, let y = luggage of first passenger in lbs.,
Then, $560 - y$ = " second " " ;
∴ Charge per lb. in pence of excess luggage
$= \frac{62}{y - x}, \frac{118}{560 - y - x}$, or $\frac{230}{560 - x}$;
$\therefore \frac{62}{y - x} = \frac{118}{560 - y - x} = \frac{230}{560 - x}$,
$\frac{31}{y - x} = \frac{59}{560 - y - x} = \frac{115}{560 - x}$;

(1) $31(560 - y - x) = 59(y - x)$
$17360 - 31y - 31x = 59y - 59x$
$59x - 31x - 31y - 59y = -17360$
$28x - 90y = -17360$
$14x - 45y = -8680$.

(2) $31(560 - x) = 115(y - x)$
$17360 - 31x = 115y - 115x$
$115x - 31x - 115y = -17360$
$84x - 115y = -17360$.

Multiplying (2) by $9\}756x - 1035y = -156240$
" (1) by $23\}322x - 1035y = -199640$

$434x = 43400$

$\therefore x = 100.$

$\therefore$ Quantity of luggage allowed = 100 lbs. Ans.

Note.—Writing good.

5. NOTNAPS.—Solve

$$\left.\begin{aligned} x^2 + xy &= a^2 \\ y^2 + xy &= b^2 \end{aligned}\right\} \text{(Colenso.)}$$

$$\left.\begin{aligned} (1)\ x^2 + xy &= a^2 \\ (2)\ y^2 + xy &= b^2 \end{aligned}\right\}$$

Adding $\}x^2 + 2xy + y^2 = a^2 + b^2$

Extracting square root $\}x + y = \pm\sqrt{a^2 + b^2}$

(1) $x(x+y) = a^2$

$x(\pm\sqrt{a^2+b^2}) = a^2$

$\therefore x = \pm\dfrac{a^2}{\sqrt{a^2+b^2}}.$

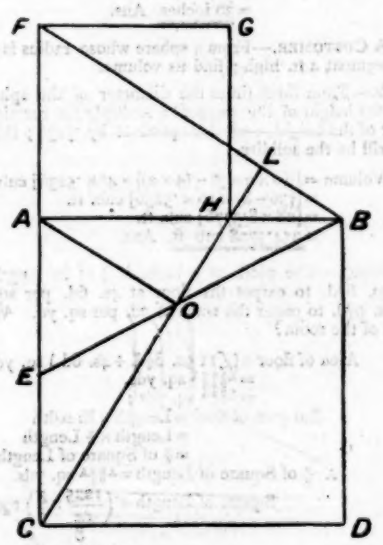
(2) $y(x+y) = b^2$

$y(\pm\sqrt{a^2+b^2}) = b^2$

$\therefore y = \pm\dfrac{b^2}{\sqrt{a^2+b^2}}$

Geometry.

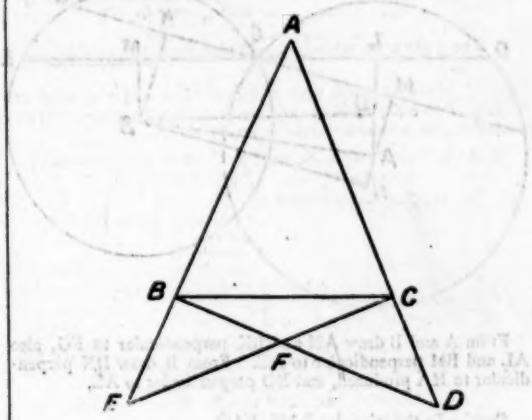
1. G. BACON.—In the figure II. 11 if CH and BE meet at O, show that AO is at right angles to CH.



Let CH produced meet BF in L.

Proof.—In the triangles HAC, FAB,
the two sides HA, AC = the two sides FA AB, each to each,
and the right angles HAC, FAB are equal,
$\therefore$ angle HCA = angle FBA, that is, angle HBL, (I. 4.)
and angle AHC = angle LHB, (I. 15.)
$\therefore$ angle HAC = angle HLB; (I. 32.)
wherefore angle HLB is a right angle.
Because EB = EF,
$\therefore$ angle EBF = angle EFB, (I. 5.)
that is, angle OBL = angle CFL;
but, angles CFL, FCL = angles OBL, LOB, (I. 32.)
$\therefore$ Angle FCL, that is, ECO = angle LOB;
and angle LOB = angle EOC, (I. 15.)
$\therefore$ angle ECO = angle EOC,
wherefore, EO = EC (I. 6.), and also = EA.
Angles EOC, EOA = angles ECO, EAO, (I. 5.)
that is, angle AOC = angles ACO, CAO,
$\therefore$ angle AOC is a right angle; (I. 32.)
wherefore AO is at right angles to CH. Q.E.D.

2. QUOD PETIS HIC EST.—Straight lines are drawn through the extremities of the base of an isosceles triangle, making angles with it on the side remote from the vertex, each equal to one-third of one of the equal angles of the triangle, and meeting the sides produced; show that three of the triangles thus formed are isosceles. (*Todhunter.*)



Let ABC be an isosceles triangle, having the sides AB and AC equal.

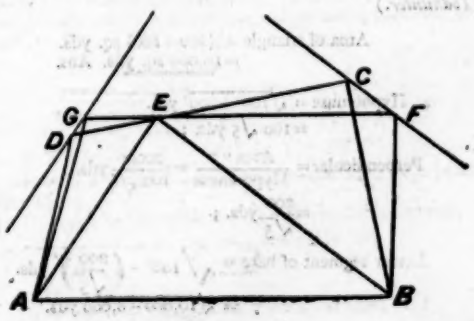
From B draw the straight line BD, making the angle CBD equal to one-third of the angle ABC, on the other side of BC, and meeting AC produced at D. From C draw the straight line CE making the angle BCE equal to one-third of the angle ACB, on the other side of BC, and meeting AB produced at E. Let BD and CE intersect in F.

Proof.—The triangle FBC has the angles FBC and FCB equal, and is therefore isosceles. (I. 6.)

Angle BFE = angles FBC, BCF, (I 32.)
= two-thirds of angle ABC;
Angle ABC = angles BEC, BCE, (I. 32.)
$\therefore$ Angle BEC = angle ABC − angle BCE,
= two-thirds of angle ABC;
$\therefore$ angle BEF = angle BFE;
wherefore triangle BEF is isosceles. (I. 6.)

Similarly, it can be proved that the triangle CDF is isosceles. Q.E.D.

3. NEMO.—ABCD is a given quadrilateral; construct another quadrilateral of equal area having AB for one side, and for another a straight line drawn through a given point in CD parallel to AB. (*Todhunter*).



Let E be the given point in CD.

Join EA, EB, and through C and D draw straight lines parallel to EB, EA, respectively.

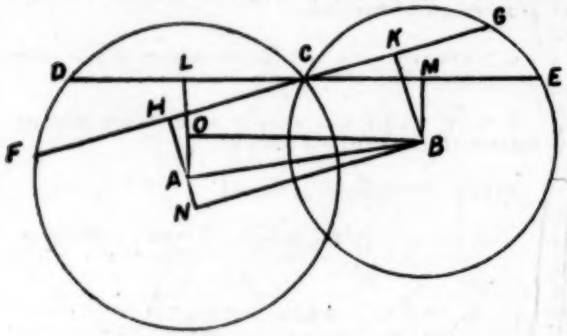
Through E draw a straight line parallel to AB, and meeting the straight lines parallel to EB, EA, in F and G.

Join BF, AG.

Then ABFG shall be the quadrilateral required.

Proof.—Triangle EFB = triangle ECB, (I. 37.)
and " EGA = " EDA, "
$\therefore$ Figure ABFG = figure ABCD. Q.E.F.

4. T. A. MUMMERY, Folkestone.—Two circles whose centres are A and B intersect at C; through C two chords DCE and FCG are drawn equally inclined to AB, and terminated by the circles; show that DE and FG are equal.



From A and B draw AH and BK perpendicular to FG, also AL and BM perpendicular to DE. From B draw BN perpendicular to HA produced, and BO perpendicular to AL.

Proof.—In the triangles BAN, BAO,
angle BNA = angle BOA, (Ax. 11.)
angle ABN = angle ABO,
since, by supposition, FG and DE are equally inclined to AB, and BN, BO are parallel to FG, DE respectively,
and side BA is common to the two triangles;
∴ side BN = side BO. (I. 26.)

Again, NB = HK, (I. 34.);
HC is half of FC, (III. 3.)
and CK ,, CG; ,,
∴ HK ,, FG;
wherefore FG is double of NB.

Similarly, it can be proved that DE is double of OB;
but NB = OB;
∴ DE = FG. Q.E.D.

Mensuration.

1. SECOND YEAR.—A field is in the form of a right-angled triangle, the two sides which contain the right angle being 100 yards, and 200 yards; find its area. If the triangle be divided into two parts by a straight line drawn from the right angle perpendicular to the opposite side, find the area of each part. (*Todhunter.*)

$$\text{Area of triangle} = \tfrac{1}{2}(200 \times 100) \text{ sq. yds.} = \underline{10{,}000 \text{ sq. yds.}} \text{ Ans.}$$

$$\text{Hypotenuse} = \sqrt{100^2 + 200^2} \text{ yds.} = 100\sqrt{5} \text{ yds.};$$

$$\text{Perpendicular} = \frac{\text{Area} \times 2}{\text{Hypotenuse}} = \frac{20000}{100\sqrt{5}} \text{ yds.} = \frac{200}{\sqrt{5}} \text{ yds.};$$

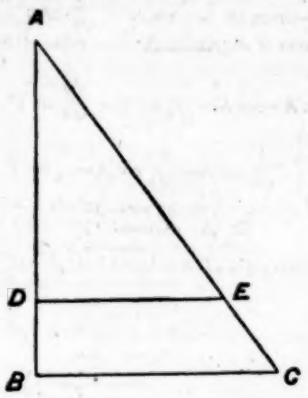
$$\text{Lesser segment of base} = \sqrt{100^2 - \left(\frac{200}{\sqrt{5}}\right)^2} \text{ yds.} = \sqrt{10{,}000 - 8{,}000} \text{ yds.} = \sqrt{2{,}000} \text{ yds.} = 20\sqrt{5} \text{ yds.};$$

$$\therefore \text{Area of smaller part} = \left\{\left(20\sqrt{5} \times \frac{200}{\sqrt{5}}\right) \div 2\right\} \text{sq. yds.} = \underline{2{,}000 \text{ sq. yds.}} \text{ Ans.}$$

$$\text{,, ,, ,,} = (10{,}000 - 2{,}000) \text{ sq. yds.} = \underline{8{,}000 \text{ sq yds.}} \text{ Ans.}$$

Note.—*Todhunter's* 'Mechanics for Beginners,' 4s. 6d.

2. DDRAIG GOCH.—



In the above diagram if BC = 20 inches, DE = 16, and BD = 6, find BA. (*Todhunter.*)

BC : DE :: AB : AD
∴ BC − DE : DE :: AB − AD : AD
(20 − 16) in. : 16 in. :: BD : AD
4 in. : 16 in. :: 6 in. : AD
∴ AD = (6 × 4) in.
= 24 in.
AB = AD + BD
= (24 + 6) in.
= <u>30 inches.</u> Ans.

3. A CUSTOMER.—From a sphere whose radius is 6 ft., I cut off a segment 4 ft. high; find its volume.

Rule.—From three times the diameter of the sphere deduct twice the height of the segment; multiply the remainder by the square of the height, and that product by ·5236; the last product will be the solidity.

Volume = [{(6 × 2 × 3) − (4 × 2)} × 4² × ·5236] cub. ft.
= [{36 − 8} × 16 × ·5236] cub. ft.
= [28 × 8·3776] cub. ft.
= <u>234·5728 cub ft.</u> Ans.

4. ROGO.—The width of a room is ⅔ of its length; it costs £11 9s. 8½d. to carpet the floor at 4s. 6d. per sq yd., and £1 12s. 9½d. to paper the walls at 3d. per sq. yd. What is the height of the room?

Area of floor = (£11 9s. 8½d. ÷ 4s. 6d.) sq. yds.
= $1\frac{1}{4}\frac{2}{4}\frac{3}{6}$ sq. yds.
= $1\frac{2}{3}\frac{3}{6}$ sq. yds;
But area of floor = Length × Breadth
= Length × ⅔ Length
= ⅔ of Square of Length;
∴ ⅔ of Square of Length = $1\frac{2}{3}\frac{3}{6}$ sq. yds.

$$\text{Square of Length} = \left(\frac{1225}{\cancel{4}\,\cancel{8}} \times \frac{\cancel{3}}{\cancel{2}}\right) \text{sq. yds.} = 1\tfrac{2}{3}\tfrac{3}{6} \text{ sq. yds.}$$

$$\therefore \text{Length} = \sqrt{1\tfrac{2}{3}\tfrac{3}{6}} \text{ sq. yds.} = \tfrac{3}{4}\tfrac{5}{6} \text{ yds.};$$

$$\text{Breadth} = \left(\frac{\cancel{2}}{\cancel{3}} \text{ of } \frac{35}{\cancel{4}\,\cancel{2}}\right) \text{yds.} = \tfrac{2}{3}\tfrac{5}{6} \text{ yds.}$$

Area of walls = (£1 12s. 9½d. ÷ 3d.) sq. yds.
= $1\frac{1}{2}\frac{7}{8}$ sq. yds.
= $\frac{2}{3}\frac{1}{6}\frac{5}{6}$ sq. yds.;
But area of walls = 2 (Length + Breadth) × Height
= $2(\frac{3}{4}\frac{5}{6} + \frac{2}{3}\frac{5}{6})$ yds. × Height
= $(1\frac{7}{8}\frac{1}{6} \times 2)$ yds. × Height
= $1\frac{7}{8}\frac{1}{6}$ yds. × Height;
∴ Height × $1\frac{7}{8}\frac{1}{6}$ yds. = $\frac{2}{3}\frac{1}{6}\frac{5}{6}$ sq. yds.
∴ Height = $\frac{2}{3}\frac{1}{6}\frac{5}{6}$ sq. yds. ÷ $1\frac{7}{8}\frac{1}{6}$ yds.

$$= \left(\frac{\overset{3}{\cancel{225}}}{\cancel{4}\,\cancel{8}} \times \frac{\overset{3}{\cancel{6}}}{\cancel{175}}\right) \text{yds.} = \underline{4\tfrac{1}{2} \text{ yds.}} \text{ Ans.}$$

General.

1. SPES.—Given $\sin A - \cos A = \frac{1}{\sqrt{2}}\cos 1° - \frac{\sqrt{3}}{\sqrt{2}}\sin 1°$, find the number of degrees in the least value of A. (*Todhunter.*)

$$\text{Sin A} - \cos A = \frac{1}{\sqrt{2}}\cos 1° - \frac{\sqrt{3}}{\sqrt{2}}\sin 1°$$

Multiplying by $\frac{1}{\sqrt{2}}$:

$$\frac{1}{\sqrt{2}}\sin A - \frac{1}{\sqrt{2}}\cos A = \frac{1}{2}\cos 1° - \frac{\sqrt{3}}{2}\sin 1°$$

$$\text{Sin A} \cos 45° - \cos A \sin 45° = \sin 30° \cos 1° - \cos 30° \sin 1°$$

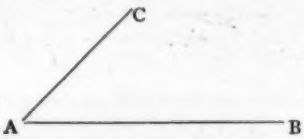
$$\text{Sin } (A - 45°) = \sin (30° - 1°)$$

$$= \sin 29°;$$

Hence the least value of A is found from $A - 45° = 29°$

$$\therefore \underline{A = 74°}. \quad \text{Ans.}$$

2. TEACHER.—The solution will be impossible in the following case.



Let CAB be the given angle, and AC one of the given sides. Describe a circle from centre C with radius equal to the other given side. If this circle does not meet the line AB, that is, if the other side is less than the perpendicular from C upon AB, the solution is impossible.

3. M. H.—If you refer to the question you will find that a son's and a brother's share are *not* multiplied together, but the percentage left from each after deducting legacy duty. We have already stated that the sum £9,603 was taken for the supposition of the amount received by a brother, simply to avoid fractions.

Any other sum might have been taken. For example :—

Suppose a brother receives £1,
Then ,, child ,, £2;
Amount left to a brother = $£1 \times \frac{100}{97}$
$= £\frac{100}{97}$,
And ,, ,, ,, child = $£2 \times \frac{100}{95}$
$= £\frac{200}{95}$;

$$\therefore \text{Total amount left} = £\frac{100}{97} \times 3 + £\frac{200}{95} \times 5$$
$$= £\frac{300}{97} + £\frac{1000}{95}$$
$$= £\frac{29700 + 97000}{9603}$$
$$= £\frac{126700}{9603}.$$

$$\therefore \underset{\pounds}{\frac{126700}{9603}} : \underset{\pounds}{12670} :: \underset{\pounds}{1} : \text{Amount received by a brother}$$
$$= £\frac{9603}{10}$$
$$= \underline{£960\ 6s.} \quad \text{Ans.}$$

4. SPURN HEAD.—Your query is solved in our issue for December, 1882.

5. G. N.—We trust that we are successful in rendering the matter intelligible to you.

$$\frac{2x-3}{x^2-3x-10} = \frac{2x-3}{x^2-3x-28}$$

$$(2x-3)(x^2-3x-28) = (2x-3)(x^2-3x-10);$$

It is evident that $2x-3$ must equal zero, or the equation would be incorrect, as the other terms are unequal. By putting $2x-3=0$, we make both sides equal to zero.

We thus obtain the value $1\frac{1}{2}$ for x, and this is the only value that satisfies the equation.

Suppose the equation were

$$\frac{2x-3}{x^2-3x-10} = \frac{2x-3}{5x-17}$$

$$(2x-3)(x^2-3x-10) = (2x-3)(5x-17);$$

Putting $2x-3=0$, we obtain one value of x which satisfies the equation; and from

$$x^2-3x-10 = 5x-17,$$

we obtain the values 1 and 7.

$\therefore x = 1, 1\frac{1}{2}$, or 7.

Take the equation

$$(x-c)(x^2-3ax+a^2) = 0.$$

The left-hand side of the equation is zero, either when $x-c=0$, or when $x^2-3ax+a^2=0$, and in no other case.

If $x-c=0$, we obtain the value $x=c$; and if $x^2-3ax+a^2=0$, we have $x=a$, or $2a$. Hence the equation is satisfied by $x=c$, a, or $2a$, and by no other values.

6. J. EDWARDS.—You will find the solution of your query in our issue for May, 1882.

7. W. T. T.—(1) Your query is solved in our issue for October, 1882. (2) Writing pretty fair.

8. F. S.—The answer is 35 per cent.

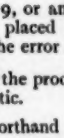
9. BON SOIR.—(1) The accuracy of results in multiplication can be tested by the following method, which is termed 'casting out the nines':—Add together all the figures in the multiplicand, divide their sum by 9, and set down the remainder; then divide the sum of the figures in the multiplier by 9, and set down the remainder; multiply these remainders together, divide their product by 9, and set down the remainder; if this remainder be the same as the remainder which results after dividing the sum of the digits in the product of the multiplicand and multiplier by 9, the sum is probably right; but if different, it is sure to be wrong.

Example :— 3874 × 68

30992
23244
263,432

(*a*) Adding figures of multiplicand } 3+8+7+4 =22; this gives 4 rem. 4 (*a*)
(*b*) Adding figures of multiplier } 6+8=14; this gives 5 rem. 5 (*b*)
(*c*) Adding figures of product } 2+6+3+4+3+2 =20; this gives 2 rem. 2 (*c*)
(*d*) Multiplying remainders (*a*) and (*b*) } 4×5=20; this gives 2 rem. 2 (*d*)

As the top and bottom remainders are the same, we presume that the sum has been accurately worked.



Note (1).—If an error of 9, or any of its multiples, be committed, or if the figures be placed incorrectly, the results will nevertheless agree, and so the error will remain undetected.

Note (2).—You will find the proof of the method on page 22 of Barnard Smith's Arithmetic.

(2) The teaching of Shorthand must be beneficial to the scholars.

10. HERNE HILL.—Your question occupies too much space

11. T. D.—The percentage for dividend is calculated on the amount of stock. If the amount invested and the price of the stock be given, the dividend can be ascertained without finding the amount of stock purchased.

12. TREE.—Please send the answer to your query; you have given the work from which it is taken, but have omitted the answer. As your communication was liable to letter-rate, and you placed only a halfpenny stamp upon it, we had to pay extra postage.

13. J. W. H.—To a weight of 1 kilogram three cords are attached. One runs vertically upwards, and passing over a frictionless peg, has a weight of two hectograms affixed to its free extremity. Another, at an angle of 60° with the former, passes

over a frictionless peg, and has a weight of 5 hectograms attached to it. What weight attached to the third will cause equilibrium, if the third make an angle of 30° with the first?

Resolved part of 2nd force in direction of 1st force
$= 5 \cos 60° = 5 \times \frac{1}{2} = 2\frac{1}{2}$;

Resolved part of 3rd force (represented by P) in direction of 1st force $= P \cos 30°$

$$= P \times \frac{\sqrt{3}}{2};$$

$$\therefore P \times \frac{\sqrt{3}}{2} = 10 - (2 + 2\tfrac{1}{2})$$

$$= 5\tfrac{1}{2}$$

$$P = 5\tfrac{1}{2} \times \frac{2}{\sqrt{3}}$$

$$= \frac{11}{\sqrt{3}}$$

$$= \frac{11\sqrt{3}}{3}$$

$$= \frac{\sqrt{363}}{3}$$

$$= \frac{19{\cdot}0525\ldots}{3}$$

$$= 6{\cdot}3508\ldots$$

∴ A weight of 6·3508...hectograms must be attached to the third cord.

14. SCOTSMAN.—The deduction (worked out) on p. 306 of Todhunter's Euclid shows how to draw two straight lines to a straight line from two points, so that they shall make equal angles with the straight line.

15. LIZZIE.—(*a*) Yes; count from commencement of apprenticeship. (*b*) Depends entirely upon the inspector. Probably the same as pupil-teacher. There is no *written* paper.

16. A READER.—According to the terms of his (or her) indentures.

17. INQUIRER.—Order the syllabus through your bookseller. It is impossible for us to find space for the mass of information you want. Latin lessons are given in this number. If you prefer a *book*, *Fowle's* 'Short and Easy Latin Book' (Longmans).

18. A REGULAR SUBSCRIBER.—'How to Teach Plain Needlework,' by E. G. Jones (Hughes).

19. MONTGOMERY.—Schoolmen were metaphysicians of the middle ages.

20. EDITH GOULDSON.—Canon Daniel's, published by National Society, is a capital book.

21. LILLY.—'Mensuration' (Chambers's), 'Algebra' (Mansford's), 'Grammar' (Morell's).

22. MONKSHAVEN.—Not unless you have passed Queen's Scholarship Examination and are over twenty-one years of age.

23. MANACLES.—(1) No. (2) Consult your inspector. (3 and 4) No limit. (5) Yes.

24. ORDER.—(*a*) Study any exact science as Euclid. (*b*) *Fitch's* 'Lectures on Teaching' (Cambridge Warehouse, Paternoster Row).

25. X. Y. Z.—No, it is not the same. You can order it through any bookseller.

26. CONFUSED OSSY.—(1) No. (2) Get good text-books and thoroughly master them. We shall be happy to help you in any difficulty.

27. CONSTANT READER.—Messrs. Crosby Lockwood & Co., Stationers' Hall Court, Ludgate Hill, London, E.C., publish some excellent French books. Write to them for catalogue. A series of French lessons are now appearing in the *Governess*.

28. X. Y. Z., RUNCORN.—There are centres in all large towns; but you had better write to the Education Department.

29. LEARNER.—There is no rule. Consult a really good Latin book.

30. FAVERSHAM.—There is no special examination for French.

31. IVY GRASS.—Daniel's (National Society's Depository) and Morris's are both excellent.

32. A SUBSCRIBER.—Yes; they will not be omitted again.

33. J. T. S.—(*a*) *Dr. Carpenter's* 'Teacher's Health,' begun in this number, will give you all information. (*b*) *d* should not be as high as *l* in large hand.

34. THOMAS BRODE.—The book does not seem to be issued by any English firm, but we will make further inquiries. In the meantime write to the Registrar and let us know the result.

35. F. W. B.—We have made many inquiries, but without success. Why not write to the Secretary for the examination? He may be able to assist you.

36. T. BRODE.—Write to Messrs. Macmillan and Co., Rivingtons and Co., and George Bell and Sons, for their catalogues.

37. W. WALLIS.—Your query is meaningless. The music must have been incorrectly transcribed. An accidental must be placed *before* and not *after* the note to which it applies.

38. LONDINIUM.—*b*. (1) *W. E. Hall's* 'International Law' and *T. D. Woolsey's* 'Introduction to the Study of International Law' are satisfactory elementary works on this subject. See also the excellent article on 'International Law' in the new edition of the 'Encyclopædia Britannica.' (2) *Westlake's* 'Private International Law,' and *Guthrie's* translation of *Carl von Savigny's* 'Treatise on the Conflict of Laws, and on their Operation in respect of Place and Time.' (3) *Ortolan's* 'History of Roman Law.' *c*. *Bertham* wrote on the first principles, not on the technicalities of law, and it can hardly be said that any of his works are in general use by English lawyers. You may read with advantage his 'Introduction to the Principles of Morals and Legislation,' republished in the Clarendon Press series.

Recent Inspection Questions.

[*The Editor respectfully solicits contributions—all of which will be regarded as* STRICTLY PRIVATE—*to this column. For obvious reasons, it cannot be stated in which district the questions have been set.*]

Arithmetic.

STANDARD I. (DICTATED).

(*a*) 92 + 880 + 71 + 690 + 85 = 1818. Ans.
(*a*) 222 − 3 = 219. Ans.
(*b*) 211 + 72 + 360 + 3 + 591 = 1237. Ans.
(*b*) 716 − 108 = 608.

N.B.—Both the sums and the tables, in each case to be got right.

Spelling.

(*a*) Wind, soap, thought, kitten, captain, holly.
(*b*) Eagle, hawk, caw, ready, bird, remain.

STANDARD II.

(1) Take fourteen hundred from fourteen thousand.
Ans. 12,600.

(2) Multiply fourteen hundred and thirty-seven by nine hundred and six. Ans. 1,301,922.

(3) Divide 36 times 27 by 9. Ans. 108.

(4) A man had 8 fields, each containing 1215 trees; how many trees would there be in each, if divided among 9 fields? Ans. 1080.

STANDARD III.

(1) Add together twenty-seven pounds sixteen shillings and tenpence halfpenny, five pounds eightpence threefarthings, three hundred and ninety-four pounds seventeen shillings and halfpenny, six pounds thirteen shillings and threehalfpence, and four thousand and sixteen pounds one farthing.
Ans. £4450 7s. 9½d.

(2) Take twenty-five pounds seventeen shillings and three-halfpence from eight hundred pounds.
Ans. £774 2s. 10½d.

(3) Divide 6,003,957 by 598.
Ans. 10,040 – 37.

(4) By how much is 19 times 57 greater than 28 times 23? Ans. 439.

STANDARD IV.

(1) Divide £110,014 0s. 0¾d. by 109.
Ans. £1009 6s. 0½d.—73.

(2) Reduce 12 weeks 3 days 15 mins. to secs.
Ans. 7,517,700 secs.

(3) Reduce 10,759 in. to English ells.
Ans. 239 E. ells 4 in.

(4) Find the value of 3½ hhds. of beer at 3½d. per pt. Ans. £22 1s.

(5) Find the value of 3½ hhds. of wine at 6s. 9d. a gallon. Ans. £74 8s. 4½d.

STANDARD V.

(1) If 2 cwts. of coal last 3 days, how long will 10 loads last, each containing 1 ton 1 cwt.?
Ans. 315 days.

(2) 14 tons 16 cwts. 2 qrs. of coal at £10 a ton.
Ans. £148 5s.

(3) If a horse travels in 3 hours as far as a train can go in 50 minutes, how far will it travel while the train is going 120 miles? Ans. 33⅓ miles.

(4) Find, by practice, the amount of a rate on £8673 18s. 6d. at 17d. in the £.
Ans. £614 8s. $0\frac{29}{40}$d.

STANDARD VI.

(1) $2\frac{4}{13}$ of $3\frac{1}{6} + 2\frac{1}{10}$ of $\frac{2}{13}$. Ans. $7\frac{17}{75}$.

(2) ·4 – ·00501 + ·91001. Ans. 1·305.

(3) If a man travels 150 miles in 9 days, walking 6 hours a day, how far will he walk in 54 days, walking 5 hours a day? Ans. 750 miles.

(4) Simplify $\frac{8\frac{2}{5} \text{ of } 1\frac{4}{11}}{4\frac{3}{5} \text{ of } 6\frac{1}{4}}$ Ans. $\frac{14}{55}$.

(5) 3·18 + 16·012 + 7·56 + 4 – 27·7.
Ans. 3·052.

(6) £2 2s. 9d. ÷ $1\frac{1}{8}$. Ans. £1 18s.

Dictation.

STANDARD III.

'On one occasion, when returning with the rolls, another dog made an attack upon the basket for the purpose of stealing its contents. On this the trusty fellow, placing it on the ground, began to fight with his assailant. He severely punished him, and then bore off his charge in triumph.'

Grammar.—Pick out the nouns, verbs, adjectives, and adverbs.

STANDARD IV.

'Royal Readers,' page 210.

'He was fond of spending what leisure time he had in making experiments in mechanics, and for a while he was very much taken up with an attempt to solve the attractive problem of perpetual motion. Although he, of course, left the question unsolved, the bent thus given to his mind remained unchanged throughout his whole life.'

STANDARD V.

From the *Daily News*.

'The concentration of interest on Lower Egypt has hitherto prevented his receiving the attention which he perhaps deserves. Many vague rumours and many official contradictions have by turns been busy with his proceedings. As we pointed out yesterday, it is so decidedly for the interest of this mysterious person that he should be believed to be victorious, with immense loss to his opponents, that some caution is necessary in accepting the rumours.'

Grammar.

STANDARD V.

Parse and analyse—
'Never knight more valiant sought the field of fight.'

STANDARD VI.

'Where was the Douglas? On the plain
They found him, 'midst the heap of slain.'

Physical Geography.

STANDARD III.

(1) What is an equinox?

(2) Describe the planet you know most about.

(3) Why is not day and night at the same time all over the earth?

(4) Name some of the planets.

(5) What are satellites?

(6) Give size of tropics, where are they, and describe them.

The Forty-two Training Colleges in England and Wales, 1884.

The Female Training Colleges are printed in Italics.

ESTABLISHED	NAME.	ACCOMMODATION.	NAME AND ADDRESS OF CORRESPONDENT.	ADMISSION FEES.
	CHURCH OF ENGLAND.			
1842	Chelsea Nat. Soc.	120	Rev. Canon Cromwell, St. Mark's, Chelsea, London, S.W.	£15 15s.
1840	Battersea ... N. S.	113	Rev. Canon Daniel, St. John's, Battersea, London, S.W.	£17 10s.
1843	Chester... Diocesan	105	Rev. Chancellor Espin, Training College, Chester ...	£10.
1852	Saltley ... ... Dioc.	101	Rev. F. W. Burbridge, Saltley, Birmingham	£10.
1847	Cheltenham	98	Rev. R. M. Chamney, Cheltenham...	£12; £14; £20.
1853	Culham ... Dioc.	92	Rev. H. Lewis, Culham, Abingdon	£15.
1847	Durham ... Dioc.	71	Rev. S. B. Smith, Training College, Durham	£12.
1846	York and Ripon Dioc.	68	Rev. G. W. de C. Baldwin, York	£15.
1848	Carmarthen ... N. S.	61	Rev. C. G. Brown, Carmarthen	£10.
1854	Exeter ... ... Dioc.	61	Rev. J. G. Dangar, Exeter	£10 10s.
1862	Winchester ... Dioc.	56	Rev. H. Martin, Training College, Winchester	£10.
1864	Peterborough	50	Rev. C. Daymond, Peterborough	£20.
1858	Carnarvon	44	Rev. J. S. Boucher, Carnarvon	£8 or £16.
1836	*Home and Colonial* ..	140	Rev. W. Bromilow, Gray's Inn Road, London, W.C. ...	£12 10s.; £15s.; £20.
1847	*Whitelands* ... N. S.	140	Rev. J. P. Faunthorpe, Whitelands House, Chelsea, S.W.	£12; £15; £20.
1844	*Warrington* ... Dioc.	120	Rev. Canon Hornby, Training College, Warrington ...	£6.
1878	*Tottenham* ... N. S.	104	Rev. E. Hobson, Training College, Tottenham, London.	£10; £15.
1853	*Bristol* ... ... Dioc.	80	Rev R. E. Richards, Fishponds, Chelsea...	£10; £12.
1841	*Salisbury* ... Dioc.	77	Rev. W. D. Morrice, St. Thomas' Vicarage, Salisbury ...	£5; £7.
1859	*Durham* ... Dioc.	70	Rev. W. H. Walter, Durham	£6; £7; £10.
1853	*Brighton* ... Dioc.	64	Rev. H. H. Wyatt, Bolney Vicarage, Hayward's Heath	£8.
1862	*Ripon* ... ... Dioc.	61	Rev. E. B. Badcock, Ripon...	£10.
1847	*Cheltenham*	60	Rev. R. M. Chamney, Cheltenham...	£10; £12 10s.; £15.
1853	*Bishops Stortford* Dioc.	60	Rev. R. A. Oram, Hockerill, Bishops Stortford	£3; £5.
1853	*Norwich* ... Dioc.	58	Rev. T. Archbold, Norwich	£3; £5.
1851	*Derby* ... ... Dioc.	44	Rev. J. W. Kewley, Training College, Derby	£5; £10.
1862	*Lincoln* ... Dioc.	40	Rev. Hector Nelson, Lincoln	£3 3s.
1858	*Truro* .. ... Dioc.	40	Rev. J. R. Cornish, Training College, Truro	£5.
1873	*Chichester*	33	Miss Trevor, Bishop Otter's Memorial College, Chichester	£20.
1873	*Oxford*... ... Dioc.	27	Rev. H. D. De Brisay, Bradmore Road, Oxford	£10; £20.
	BRIT. AND FOR. SCH. SOC.			
1813	Borough Road ...	130	Alfred Bourne, Esq., Borough Road, London, S.E. ...	£20.
1858	Bangor...	60	Rev. D. Rowlands, Bangor	£10 10s.
1861	*Stockwell*	125	Alfred Bourne, Esq., Borough Road, London, S.E. ...	£15 15s.
1876	*Darlington*	74	W. A. Spofford, Esq., Training College, Darlington ...	£15 15s.
1872	*Swansea*	55	David Williams, Esq., Training College, Swansea ...	£12 12s.
1884	*Saffron Walden* ...	50	Alfred Bourne, Esq., Borough Road, London, S.E.	£15 15s.
	WESLEYAN.			
1851	Westminster	130	Rev. D. J. Waller, Wesleyan Training College, 130, Horse-	£15 15s.
1871	*Southlands*	111	ferry Road, Westminster, S.W.	£10 10s.
	CONGREGATIONAL.			
1852	Homerton	24M 31F	E. Liddell, Esq., The College, Homerton, London, E. ...	£15 15s.
	ROMAN CATHOLIC.			
1852	Hammersmith ...	70	Rev. T. Graham, Brook Green House, Hammersmith, W.	£2 10s.; £5.
1856	*Liverpool*	115	The Principal, 96, Mount Pleasant, Liverpool	£5.
1874	*Wandsworth*	50	T. W. Allies, Esq., Training College, West Hill, Wands-	
			worth	£5.
	Total ...	3285		

Our Training Colleges.

THE number of candidates for admission into the Training Colleges of England and Wales at Midsummer, 1881, was 4,935, and the seats occupied at the examination last July (1882) amounted to 5,602, there being 2,061 male and 3,541 female candidates. At least one-fourth of the whole number of pupil-teachers complete their apprenticeship annually. If every one entitled to a seat should claim to be examined next July, there will be about 8,500 candidates, besides those who, having previously failed, will make a second or third effort to secure the advantage of a professional training. There will be, in addition, a few young men and women who have not been regularly apprenticed as pupil-teachers, but who seek employment in our public elementary schools. Every year a certain proportion of the candidates attend the admission examination merely to qualify for an assistantship under Article 51 of the New Code, or to obtain a provisional certificate (under Article 52), which will entitle them to take charge of schools whose average attendance does not exceed sixty. It is not sufficiently well known that both *these* qualifications can be obtained by pupil-teachers at their own schools (Articles 50 and 52), and that attendance at the admission examination can afford them technically no advantage beyond the double chance of success. Pupil-teachers are *not* released from service by such attendance; and should a candidate fail to *complete* satisfactorily the last year of his

apprenticeship, and afterwards find that he has not passed the examination in the First or Second Division, he cannot become an assistant unless he is a graduate of some university (Article 51). In the case of such neglect and failure, he must wait at least one year, and pass the next entrance examination as a non-pupil-teacher, in order to be recognised on the effective staff of any elementary school under Government inspection. It is to guard pupil-teachers against the possible consequences of errors of this kind, and to give some definite information which may be useful to all competitors at the approaching entrance examination, that this paper has been projected.

The forty-one Training Colleges in England and Wales can accommodate at least 3,200 students. As the course of training is now arranged for two years, there are between 1,500 and 1,600 vacancies, which have to be filled from among those who succeed in gaining a 'first or second class' at the examination, as those who are ranked in the third class are not admissible (Code, Article 118a). The authorities of each college, on their own responsibility, admit to the examination as many and such candidates as they may select, provided that each one who has been a pupil-teacher has satisfactorily completed his engagement, or will do so before the next following examination, and that every other candidate will be more than eighteen years of age on the 1st of January next following the examination (Article 48). There is no limit of age upwards; but though all apprenticeships *must* terminate after the age of eighteen years (schedule vi., clause 2, note), comparatively few students complete their twenty-first year during their residence in college.

The great majority of pupil-teachers who intend to compete for a Queen's Scholarship will be guided in their choice of the centre at which they will be examined by the traditions of their schools, by the advice of their head teachers, by their religious preferences, or by the proximity of a Training College to their home. Some of the colleges have not sufficient accommodation for all approved applicants, and extra halls have to be provided during the examination. Besides the forty-one centres alluded to, the Education Department has occasionally arranged for others in some of our large towns. The examination papers issued from Whitehall are now the same for all the centres, and in this respect one candidate can have no advantage over any other, in whatever part of the kingdom he may sit. If, therefore, the authorities of a given college do not require attendance for personal examination, a qualification can be obtained at any other centre; but generally the selection for admission is made from those candidates who make application for admission to that college, and who thus become personally known to the authorities. In a few cases no others are admitted.

The subjects of the Government examination include Reading, English Grammar, Arithmetic, Geography, History, Language, Science, Drawing, Music, and Needlework. Every pupil-teacher must have studied most of these during his apprenticeship according to the scheme set forth in the Fifth Schedule of the New Code. The extent of the knowledge demanded in each subject may be gathered from the questions of last year, which have just been published with the Class-List of successful candidates, in a sixpenny pamphlet.* The PRACTICAL TEACHER of August and following months contained some model answers. Ordinary diligence in study and practice in reproduction will secure a pass; but to stand high in the list of successful competitors, a candidate will require a full and exact knowledge of the common subjects, facility in the use of his own language, and some acquaintance with *one* of other four prescribed—Latin, Greek, French, German, as well as a pass in *one* of the eight science subjects named in the Schedule V.† A successful examination in any of these subjects, chosen from among the twelve, will tend to raise a candidate's position on the class-list, but will in no wise compensate for ignorance of the routine subjects, failure in some of which is total failure. Another mode of securing additional marks is to have previously passed the examinations in freehand, geometry, perspective and model drawing. If by taking the 'blackboard exercise' at some Training College in November a pupil-teacher has obtained a drawing certificate ('Full D'), he will be in a position of great advantage when he becomes a Queen's Scholar. Proof of practical skill in Music, according to a prescribed scheme, is a fourth mode of adding to the number of marks (Schedule V., Drawing, Music). Pupil-teachers often fail in their writing. Four years' neglect during apprenticeship results sadly for many in this respect. Not having acquired a good 'current hand,' they labour under a mechanical difficulty, and are unable to produce with ease in the time allowed the knowledge which they confidently possess. A stiff, crabbed, or indistinct 'hand' does not impress favourably. Candidates should write legibly, without flourishes, and with marked regular distances between the words. As the handwriting is of necessity exhibited in all the papers, this 'mechanical' qualification—one of the 'three R's'—must not be disregarded. We repeat, failure in writing means total failure; at least it was so formerly. Of late years the marks assigned to each of the several subjects have not been published, but Reading and Arithmetic may be safely included with writing as necessary to a 'pass.'

REMARKS ON THE TABLE.

The Training Colleges can accommodate 3,285 students—1,454 males, and 1,831 females; but, for sanitary reasons chiefly, they do not all receive the full number for which they are sanctioned by the Education Department, Whitehall. Thirty colleges belong to the Church of England, and are mostly Diocesan. Three of the largest were founded by the National Society; and Tottenham, the most recent, was aided by the Society for Promoting Christian Knowledge. A few institutions were in existence in other localities at dates earlier than those quoted in the margin. Others, notably those at Borough Road and Westminster, which at first received teachers of both sexes, have been supplemented by Stockwell and Southlands respectively. Saffron Walden is a new

* Longmans and Co. By post 7d.

† Mechanics. Magnetism and Electricity.
Chemistry. Physiography.
Animal Physiology. Botany.
Acoustics, Light and Heat. Principles of Agriculture.

Marks are given at the Admission Examination for only *one* language. Additional marks may also be obtained by a candidate who has taken a first class in the elementary stage, or who has passed in the advanced stage of *one* science subject at the last or any previous examination held in May by the Science and Art Department.

college, to which, as there will be no 'senior' students in 1884, infants' school mistresses, who wish to have a year's training, are invited to supply their place under Article 118b of the New Code. Homerton is now the only college which receives both male and female students.

In addition to the literary examination already named, every student must undergo a strict medical examination. It not unfrequently happens that candidates are advised to 'wait another year,' as being in the opinion of the college physician unfit physically to bear the heavy strain of a two years' course. The Education Department insist on great precaution in this respect. It is found that less than two per cent. break down from failure of health, and in most cases young men and women are more vigorous on leaving college than on their admission.

Candidates for scholarships have also to undergo an examination in religious knowledge, the character of which varies in the different colleges, and from year to year. In some cases, such examinations taken annually during apprenticeship, or some others, are accepted instead. In the Colleges of the British and Foreign School Society there are no special examinations of this nature, but satisfactory testimony as to moral character is required as in all other cases.

The fees marked in the table vary greatly. In one or two cases they may be paid quarterly, in a few instances yearly; but in all cases in advance. Candidates, of course, pay their own travelling expenses, and provide clothing and books, which latter will cost from £3 to £6. In colleges in which there is a volunteer corps, all students are expected to enrol themselves. In some colleges there are exhibitions, and prizes in money for those who stand high in the special Scripture examination or on the scholarship list. Where two or more sums are marked in the table, the lowest sum is generally the charge for First Class Queen's Scholars only. A few colleges admit 'private students' at increased sums. In Scotland exhibitions are offered to all Queen's Scholars of (say) £25 or £23; but the students must provide their own lodgings, board, etc.

Particulars in respect to each college may be obtained from the correspondent named in the table.

The studies pursued in all the colleges are now essentially the same, and each year's course has reference to the Certificate Examination at Christmas.* There may be a difference in the languages chosen, though Latin and French are generally selected. There was only one college for men which (in 1881) presented no candidates in language. In each there were candidates in one or two sciences. In the college for females French is taken by a few of the students; and eight colleges presented none for language in 1881. The selected science subject in that year was Animal Physiology, or Botany, or Physiography.

* Reading and Repetition from Memory (300 lines), Penmanship, School Management, Grammar and Composition, Geography, History, Arithmetic, Algebra, and Mensuration, Geometry, Economy, Vocal Music, one or two (not more) of the four languages, Latin, Greek, French, German, and one or two (not more) of ten Science subjects—viz., Mathematics, Theoretical Mechanics, Applied Mechanics, Acoustics, Light and Heat, Magnetism and Electricity, Inorganic Chemistry, including Practical Chemistry, Animal Physiology, Elementary Botany, Physiography, and (in future) Principles of Agriculture. Instead of Algebra, Mensuration, and Geometry, Female Students take Domestic Economy, Sewing, and Cutting Out. They are also limited to *one* language and *one* science subject in a year.

Drawing, Vocal Music, and Science Examinations are held shortly before the general Examination. Marks gained for the Special Subject of Language or Science will not be added unless the total of the other marks entitle a candidate to a certificate. Henceforth a pass in the First Year's Papers will secure only a Third Class Certificate, which does not qualify for the charge of pupil-teachers (Art. 66).

When admitted to a training as a Queen's scholar, every student signs a declaration that he (or she) intends *bonâ fide* to adopt and follow the profession of teacher in a Public Elementary School or in the Army or Navy, or (within Great Britain) in Poor Law Schools, Certified Industrial Schools, or Reformatories. He is also expected to remain at his first school until he has obtained his parchment (Art. 62).

The average salary of a certificated master is now £120 16s. 1d.; of a mistress, £72 10s. 4d. Candidates who have redeemed the time before entering college, and have possibly matriculated at some university, will easily gain a degree on leaving college, and will probably secure the prizes which, during the next decade, will be offered to teachers of high moral character and intellectual ability.

Anecdotal Natural History.

BY REV. J. G. WOOD, M.A., F.L.S.,

Author of 'Homes without Hands,' 'Nature's Teachings,' etc.

AND THEODORE WOOD,

Joint Author of 'The Field Naturalist's Handbook.'

No. XXV.—THE MARSUPIALS.

Part IV.

THE pretty and graceful little Pouched Mice (*Antechinus*), which are among the most abundant of all the Australian quadrupeds, are chiefly remarkable for their wonderful scansorial powers, which far surpass even those of the very squirrels themselves. For not only can these little creatures traverse the branches of the trees with the most astonishing quickness and activity, but they can also pass along the lower surfaces of the boughs, and even descend with their heads downwards, contrary to the custom of the generality of tree-frequenting mammals.

There are some twelve or fourteen species of pouched mice at present known to science, all of which are natives of New South Wales and Southern Australia. They are of minute dimensions, the largest barely equalling an ordinary English rat in size.

THE Myrmecobius (*Myrmecobius fasciatus*), which stands next upon our list, is well worthy of notice, if only on account of the wonderful number of its teeth, no less than fifty-two of which are found in the jaws of an adult specimen. It also possesses several other peculiarities of structure, one of which lies in the absence of the marsupial pouch, the young being protected during extreme infancy by the long hairs with which the lower surface of the body is densely clothed.

The myrmecobius is one of the prettiest members of the family to which it belongs, both form and colouring being singularly pleasing. The ground-colour of the fur is a delicate fawn, gradually deepening from the shoulders to the tail, and becoming almost black upon

the hinder portions of the body. Crossing the back are several bands of white, broadest upon the spine, and gradually tapering to the extremities. The tail, which is long and bushy, has a singularly grizzled appearance, which, upon closer examination, is seen to be due to the intermingling of white and black hairs, which are present in almost equal proportions. Although by no means a large animal, the myrmecobius is yet considerably superior in size to the pouched mice, its average length being about seventeen inches, nearly two-fifths of which are occupied by the tail.

The myrmecobius generally takes up its abode in the interior of a fallen and decaying tree, or, failing such a refuge, in some convenient crevice in the ground. From this retreat it cannot be driven even by the practised hand of the native hunter—smoke itself, generally so efficacious in such cases, being insufficient to dislodge the little animal from its hiding-place. Whether it is that the fumes have comparatively little effect upon it, or that it prefers a death in its hole to one at the hands of its pursuer we cannot tell, but it is an undoubted fact that when once a myrmecobius has gained its habitation, no human artifice will induce it to retreat therefrom.

An active, although not a very swift animal, the myrmecobius is not very easily captured, as it invariably makes for the nearest place of refuge should it happen to be pursued. When retreating, it travels by means of a series of short jumps, every now and then pausing and assuming an erect position in order to see whether the threatened danger has passed away. While thus running, or rather leaping along, it carries the tail over the back, much after the fashion of the common squirrel.

Should its pursuer be sufficiently active to overtake and capture the little animal, the myrmecobius accepts the change in its fortunes with remarkable equanimity, never attempting to show fight, but only giving vent to a succession of small grunts when it first finds itself unable to make its escape. It is a native of Western Australia, the borders of the Swan River appearing to be the locality in which it is found in the greatest abundance.

The name of myrmecobius signifies that it lives on ants, which it captures with its long tongue, much after the fashion of the true ant-eaters. It does not, however, restrict itself to ants, but eats various other insects, and can, at a pinch, sustain life on vegetable food.

WE must now pass to the solitary group of marsupiated animals not native to Australia, namely, the well-known Opossums of North and South America. Of these animals some thirty species are known to science, only three or four of which, however, can be described in these pages.

All the opossums are admirably suited for an arboreal life, the toes being armed with sharp and curved claws, which can be inserted into the smallest crevices of the bark, and thus obtain a foothold where the ascent or descent of the animal would otherwise be impossible. Then, the thumbs of the hinder paws are opposable to the fingers, so that considerable power of grasp can be obtained where the smaller branches are concerned. And, even more important, perhaps, the tail is fully as prehensile as is the same organ in the case of the spider-monkeys which inhabit the same continent, and of which a description has already been given in these pages.

Strange to say, however, notwithstanding all the structural advantages with which it has been gifted by Nature, the opossum is by no means an active creature, although, when pressed, it can attain a considerable speed. Even then, however, its gait is of as clumsy a nature as can well be imagined, the animal using the limbs of the right and the left side simultaneously, somewhat after the fashion of the camel.

Upon level ground, too, the plantigrade structure of its feet still further diminishes its activity, and that to so great an extent that, if pursued, the animal never trusts for a single moment to its speed of foot alone, but is constantly on the watch for some retreat in which it may lurk until the danger has passed away.

When chased by dogs alone, the opossum invariably makes for the nearest tree, and there climbs to some suitable resting-place, whence it complacently looks down upon its baffled pursuers, just as does a cat under similar circumstances.

Mostly it crouches closely upon the upper surface of a lofty branch, twists its tail round the bough, and looks so like a protuberance of the bark, that even the most practised hunters find a difficulty in detecting it.

But if, as is generally the case, the dogs are accompanied by hunters who know their business, the opossum's chance of escape is extremely small. Guided by the impatient barking of the dogs, the pursuers quickly arrive at the tree in which the quarry has taken refuge, and at once take measures for dislodging it from its retreat, one of the party ascending the tree and violently shaking the branch to which it is clinging.

For some little time the doomed animal bravely retains its hold, but before very long the exhausted muscles refuse longer to perform their work, and the opossum falls helplessly to the ground, there to be at once pounced upon and destroyed by the dogs lying anxiously in wait for their expected victim.

To the negroes, by whom so large a proportion of the outdoor labour is performed in America, a greater treat can scarcely be promised than 'a 'possum hunt' at the close of their day's work. For not only do they enjoy the moonlight sport, together with the unaccustomed sensation of at least temporary liberty, but also look forward to the feast which the flesh of the slain opossums will yield them after their return from the chase.

The slaughter of the opossum, whenever practicable, is a very necessary precaution, for the farmer has scarcely a more inveterate foe than the quiet and cunning little animal which steals under cover of night to his hen-roosts, and there causes the most terrible havoc amongst the slumbering inmates. And small chance has the luckless owner of preventing the ingress of his insatiable little foe, which can climb over any fence, and squeeze through the smallest apertures, and which, moreover, is perfectly certain not to leave the farmyard until it is thoroughly glutted with the flesh and blood of its feathered victims.

But, fortunately enough, although the opossum is in many ways possessed of the deepest cunning, it is yet singularly unsuspicious of anything of the nature of a trap, and may be easily caught by means of the most transparent of artifices. But for this curious simplicity of character, the opossum would indeed be a terrible foe to the farmer, who could scarcely hope to keep a single head of poultry until every one of his four-footed enemies had been driven from the neighbourhood.

Not only does the opossum direct its attacks upon the inhabitants of the farmyards, for it is equally destructive in plantations and orchards, which often suffer most severely from its ravages. Of maize it appears to be especially fond, procuring the grain either by ascending the stem, or else by biting it across and so breaking it down. Fruit of various kinds, too, is a favourite article of its diet; the animal generally suspending itself from some branch by means either of its hinder paws, or of its prehensile tail, while the fore-feet are engaged in plucking and transferring the coveted food to the mouth.

The Virginian Opossum (*Didelphys Virginiana*), whose habits have just been described, is a native of various parts of the United States. It is a fairly large animal to be a tree climber, being about equal in dimensions to a well-grown cat, the full length of an adult specimen being generally rather over three feet.

Opossum.

Of this, perhaps fifteen inches is occupied by the tail, which is not unlike that of the common rat, the base only being clothed with hairs, while the remainder of the organ is covered with scales, between the interstices of which protrude a number of short black bristles. The general colour of the animal is a greyish-white, slightly variegated with brown.

The Virginian opossum does not hibernate, or spend the winter in a state of torpor, as might reasonably have been expected, but continues to make its nightly peregrinations in search of food even during the most inclement seasons of the year. Nevertheless, in order to allow it to resist the severity of the weather, large stores of fat are accumulated before the approach of winter, just as is the case with those animals which spend that period of the year in a condition of inactivity. It is probable, also, that the creature derives its sustenance, in a certain measure, from these fatty accumulations, and is thus enabled to subsist upon the comparatively meagre fare with which it is obliged to content itself during the colder months of the year.

The opossum generally constructs its nest in some secluded situation, such as the hollow of a tree, where it is secure from observation. Occasionally, however, it has been known to seize upon the domicile of some other animal, such, for instance, as that of the squirrel, and there to bring up its own family in place of that of the lawful owner.

The young are some twelve or fifteen in number, and at the period of their birth are of wonderfully small dimensions, their whole length, the tail included, being less than one inch. Immediately upon coming into the world they are transferred to the marsupial pouch, which, in the opossums, is well developed, and there remain for about five weeks, at the expiration of which period they are enabled to leave the protecting shelter.

For the first week or two of their existence, the young opossums are not only blind, as is the case with the offspring of the dog, the cat, and other animals but are also deaf, eyes and ears being alike closed until several days have elapsed. Yet the little creatures are by no means as helpless as might be expected, and, if removed from the pouch of the parent, can crawl about with some little activity, and can survive for some hours the deprivation of the accustomed food and shelter.

IN tropical America we find the Crab-eating Opossum (*Philander cancrivorus*), so-called from its fondness for crabs and other marine crustacea, which form a very considerable portion of its diet.

This opossum seems even less at its ease upon level ground than does the Virginian species, and appears never to leave its favourite trees, excepting under the pressure of absolute necessity. Nor is it a very active animal even among its native branches, for it seldom ventures to take a single step without previously coiling the prehensile tail firmly round some convenient bough, in order to make certain of the security of its position.

(To be continued.)

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Publications Reviewed.

Teacher's Prayer Book, being the Book of Common Prayer, with Introductions, Analyses, and Notes. By Alfred Barry, D.D., D.C.L. London: Eyre and Spottiswoode.

This is likely to prove a very useful book to teachers, and its merits consist not only in the amount and excellence of the information it contains, but also in the convenient way in which that information is arranged, and the admirable manner in which the book has been got up. The general principle adopted is, that while the page to the right hand is devoted to the text, the notes relating to it are placed on that to the left. This adds materially to the look of uniformity throughout the book, and also, to a great extent, obviates the necessity of using very small type. The notes are concise and to the point, and the name of Canon Barry, the editor, is a sufficient guarantee for their reliability. The book will not only prove very useful as a text-book to the teacher and student, but also to every intelligent and inquiring Churchman who desires to learn something about the history and substance of the Prayer Book he so constantly uses.

The Variorum Teacher's Edition of the Holy Bible. With various Renderings and Readings from the best Authorities. Edited by the Rev. T. K. Cheyne, M.A., the Rev. R. L. Clarke, M.A., S. R. Driver, M.A., and A. Goodwin, M.A., and the Rev. W. Sanday, D.D. London: Eyre & Spottiswoode.

A careful examination of this volume enables us to say that it is the best of its kind that we know, and that to the teacher, the student, and the Bible reader generally, it will prove simply invaluable. A glance at the table of contents will show that its scope is so large that it may well be described as a Biblical Encyclopædia. To begin with, it is a Reference Bible. At the foot of each column are appended, as footnotes, the various readings which have been suggested for those obscure or mistranslated passages which occur in that column. At the end of the New Testament is added, as an appendix, a book called 'Aids to the Student of the Holy Bible,' also issued by Messrs. Eyre and Spottiswoode, the worth and utility of which is abundantly proved by the enormous circulation it has had, of over a quarter of a million. This appendix contains, in addition to a vast amount of other information, a summary of the contents, history, authorship, etc., of the various books of the Old and New Testament, as well as carefully compiled tables and dictionaries of all those subjects for information on which the reader of the Bible has, in the ordinary course of things, to apply to large and expensive works of reference. Then follow a glossary, indexes of proper names, and a concordance; and the book concludes with an extremely well-brought-out Bible atlas, with classified index of names. This slight *resumé* of the contents will give the reader an idea of the scope of this edition, and we will conclude our remarks by saying, that the book has our highest and heartiest commendation.

Elementary Dynamics. By William Garnett, M.A. Deighton, Bell and Co.

Mr. Garnett has rapidly made a name for himself in the department of physical science, as it is still unhappily called. He promises to help us not to forget his and our master, James Clerk Maxwell, but almost to forget that we have lost him. Mr. Garnett's swift rise during the last few years to the very highest rank among physicists, his exceedingly successful career at Cambridge, his position to-day as mathematical and physical professor at University College, Nottingham, and his holding the post of examiner in Natural Philosophy at the University of London are all evidences of his power, and it is good to note that he is not so marred by success as to forget his early times. He places next after his name, not his fellowships, professorships, examinerships, but the words 'late Whitworth Scholar.' When we reflect upon the nature and conditions of these Whitworth scholarships, upon the class of young men to whom they have been of incalculable help, upon the excellence of the work that they have enabled so many clever but hardly entreated youths to do when they became men, it is an encouragement to all, and not least to the young workers, to see Mr. Garnett recording as his first honour the fact that he was a

Whitworth scholar, and to realise the place now filled by him in the world of science.

We have written this much of the author lest those who know neither him nor his work may accuse us of exaggeration when we state very unreservedly that Mr. Garnett's book on dynamics is the best one on that subject that has come within our reach. In method of arrangement, in clearness, in the fulness with which illustration after illustration of the most important principles are worked out, in the number and the excellence of the examples given on each section, it stands quite in the first rank. We would especially commend, at the risk of making a distinction that may seem invidious in respect to other parts of this very excellent volume, the pages (63-91) in which he deals with that bugbear of the beginner, 'units.' The student who will read these pages with an understanding mind should rise from their perusal with that mind clear once and for ever upon the fundamental conceptions of units of impulse, work, density, volume, acceleration. Another special merit is the clearing up of the difficulties that environ the words *impulse* and *momentum*. Momentum = mass and velocity; impulse = the *whole* momentum generated by a force. Mr. Garnett also renders very comprehensible even to the young student the modern and more accurate method of measuring all force after the manner indicated by the second law of motion. To those who purpose entering upon the study of dynamics under the guidance of Mr. Garnett, we may state that only so much knowledge of mathematics is necessary to the understanding of his book as is involved in the acquaintance with ordinary simple algebra and the mere rudiments of plane trigonometry. We end by repeating the substance of all that we have written, when we say that students can study this branch of physics under no guidance that would be better than that of the 'late Whitworth Scholar.'

Chambers's Geographical Readers. Standard I. This little book is admirably adapted to fulfil its intended purpose, that of presenting in an interesting and readable manner the geographical subjects required by the Code of 1882 for Standard I. The book is printed in very clear type, and the illustrations are both numerous and appropriate. We have pleasure in recommending this little reader.

Wall Map of North and South America. London and Edinburgh: W. and A. K. Johnston.

This is a large and striking chart, with the names distinctly marked, and the various political divisions as clearly defined as it is possible for difference of colour to make them. Amongst other good features, we note the insertion of the various cables across the Atlantic, with names and dates of laying. In these days of electricity important oceanic cables should have their place on maps as much as railways. We have never yet seen in a school atlas a sketch map of the British Isles with the main railways inserted, printed in different colours to distinguish the various lines, and the chief junctions emphasized by special marks, though we feel sure a map of such a kind would be a great boon to many of the candidates preparing for the Civil Service and other examinations, in the papers set at which there are usually one or two questions bearing on railroad communication.

Illuminated School-room Mottoes. London and Edinburgh: W. and A. K. Johnston.

These adornments for school-room walls are striking and effective specimens of lithographic skill. They measure some four or five feet in length, by a foot wide, and the mottoes emblazoned thereon are carefully selected as embodying some lesson or fact it is well should be impressed on youthful minds. Amongst them we note the time-honoured sayings: 'Where there's a will, there's a way;' 'Pride will have a fall;' 'An idle youth is a needy age;' 'Diligence is the mother of good fortune,' and others equally appropriate. The whole series has our cordial commendation.

Plain and Solid Mensuration for Beginners. By William Dodds. London: Thomas Murby.

A very practical little work, and one which has been very carefully written and happily arranged. The examples are not only copious and clearly expressed, but also thoroughly practical in character and not too difficult. The home-student will find the short explanatory *resumé*, appended to some of the more difficult questions, of great assistance to him when working without a master; and to the candidate preparing for any of the more usual examinations, the questions have the additional merit of being to a great extent typical of those examinations, as many of them have been selected from the published papers.

The Book of Genesis. Murby's Scripture Manuals. London: Thomas Murby.

This is an enlarged and revised edition of a little manual which has already been for some time favourably received by the public. It has been prepared with considerable care, and will prove of great service to students preparing for examination in this particular portion of Scripture history. In order to give a general idea of the scope and arrangement of the book, we may add that, after a short introductory sketch of the Book of Genesis, there are given the main sections into which that book may be divided, a brief summary of the chapters suitable for committing to memory, then a more complete account of each chapter, followed by chronological and biographical notes, an account of the places mentioned, and explanatory notes on the chief difficulties met with in the verses. The explanatory notes in some few cases might, we think, have been with advantage expanded.

Arithmetic. Standards I.—VII. The Comprehensive School Series. London: Blackie and Son.

We are glad to be able to report favourably of this series. In all the books, though every fresh rule is carefully and clearly explained, the chief aim has been that of affording ample scope for *practice* without encroaching upon *teaching*, which is, as it should be, greatly left to the teacher. The exercises are exceedingly numerous, and the sums in them, besides being carefully graduated, are very varied in style, thus giving as much scope as possible for intelligent work and preparing the scholars for any test the inspectors may set them. We are glad to see that the Unitary method is treated on, and that due stress is laid on the importance of that plan of working proportion sums.

True Stories of Foreign History. London: Blackie and Son.

These true stories are told in simple language to suit young minds, and are so full of thrilling interest that they read like romances. We can heartily recommend the pretty little book and hope it may have a wide circulation. The tinted frontispiece is very artistic.

Tales from English History. Number One. London: Marcus Ward and Co.

This little book is intended for the use of Standard III., and is the first of a series of four books brought out to meet the requirements specified by the New Code for the use of Standards III. to VII. It contains twenty-nine chapters, treating on some of the many remarkable events which have characterised our history from the earliest to modern times. The account of each event is thrown as much as possible nto the form of a tale, and the result is the production of a very fairly readable little book. The illustrations are numerous and appropriate, and the maps will materially assist the scholar in duly understanding the text.

Early England, to the Death of Stephen. Marcus Ward's History Readers, No. II. London: Marcus Ward and Co.

This is an interesting and well-arranged little book, which, from its serviceable binding and clear printing, is well adapted for school use. We are sorry we can give only qualified praise, however, to the illustrations, as some of them are but poor productions, their deficiencies being all the more patent from the otherwise excellent get-up of the book. The poetical selections interspersed throughout not only constitute an agreeable relief to their prose surroundings, but are also very appropriate in subject, and, as they have been chosen from the works of some of our best authors, contain none of those doggerel rhymes which so much disfigure many of the reading books now in use.

Longmans' Magazine. No. IV. London: Longmans and Co.

This is an excellent number, at once interesting and instructive. The articles are contributed by James Payn, Justin McCarthy, Grant Allen, Julian Sturgis, Andrew Lang, Austin Dobson, R. A. Proctor, and the author of 'Vice Versâ.'

Shakespeare's Julius Cæsar. With Notes and Examination Papers. By Thomas Parry. London: Longmans, Green, and Co.

This book has been prepared, the preface says, for use in the upper classes of elementary schools and for junior work. We have pleasure in recommending it as being thoroughly adapted for such purposes. To begin with, no better selection could, perhaps, have been made from Shakespeare's works, for the use of children, than this play, for not only is the plot one which is calculated to sustain the youthful interest throughout, but also the play itself is particularly free from those examples of license in language and action which characterize many of the others. The type employed in this edition is large and very legible, and additional prominence is given to certain of the more important points in the story by the insertion in the text of several explanatory woodcuts. The notes, placed at the end, are copious and thorough, and the book is made more complete, and its value as a school book increased, by the addition of examination papers and an etymological appendix.

Selections for Latin Prose. By R. M. Millington, M.A. London: Longmans and Co.

The fact that the present is the fifth edition of this work testifies in an unmistakable manner to its appreciation by the public. In it several alterations and additions have been effected, which will, the author hopes, be considered improvements. The chief is that each page is complete in itself and contains both the selection to be translated and the copious notes explanatory of it. Since the selections have been, to a large extent, taken from papers set at the various competitive examinations, the book has this additional feature to recommend it to those preparing for such ordeals, and when there is a good teacher to fall back on, it will, we have no doubt, prove most serviceable in school work.

Outline Maps from the Public School Atlas. London: Longmans and Co.

This series will bear comparison with any we know, and merits our warm commendation. Those who know the Public School Atlas will understand that since these maps correspond with them in size, they are large enough to enable the student to insert all the more general topographic features of a country without much 'crowding.' The paper and printing are both good, and since the price is moderate, we can confidently predict for the series a large sale.

Introduction to Latin Prose Composition. By R. M. Millington, M.A. Longmans.

A useful school-book for higher classes: the very capable author has been successful to a fifth edition in his 'Selections' for the same.

Myths of Hellas, by Professor Witt. Translated from the German by Frances Younghusband. Longmans.

The pleasantly poetic fables of old time, which so many have recorded from Lord Bacon downwards in our own tongue, and from Hesiod and Homer through Apollodoros, who collected these old stories two centuries before Christ in the Greek. The translator has done her work intelligently and eloquently; and we must not omit a word of praise for the very copious and useful index.

A Concise English History. By W. M. Lupton. Longmans.

A handbook especially intended for pupils preparing for the numerous examinations enforced in these days of cramming; wherein, as in the last noticed, a most carefully gathered index is a principal feature.

Reading Sheets. For the Introductory Primer. Fourteen in Number. London: Longmans and Co.

These fourteen wall-sheets are well devised and well printed. Commencing with a tabular representation of the small and capital letters, they lead onward, in carefully progressive steps, through words consisting of two letters to words formed of three and four. Acting on the well-known power of captivation which a picture has on the juvenile mind, each sheet is embellished with a woodcut illustrating the meaning of some word or words mentioned on it.

My First Mensuration. Surfaces and Solids. With Answers. By M. H. Senior. Manchester: Thomas Greenwell.

This little treatise is intended as a companion to a small book by the same author, entitled, 'My First Algebra,' which has already been reviewed in these columns (vol. ii., p. 402). The arrangement is good, and the questions have evidently been compiled to draw out the intelligence of the learner as well as show his full comprehension of the formulæ involved. To give an example of this: instead of simply saying, find the circumference of a circle whose radius is forty-two yards—a question which would merely test the learner's knowledge of the formula for obtaining the circumference of a circle when the radius is given—the query is thrown into a form which makes the worker use his brains and think *where the formula comes in*, and runs: A goat is tethered to a stake by a rope forty-two yards long; what is the circumference of the circle of grass he could graze? To the scholar who has a slight knowledge of Algebra and Euclid, this little book is likely to be of much service.

The Teacher's Manual of Object Lessons. By A. Park, F.E.I.S., F.R.G.S. London: John Heywood.

When a book bears on its title-page, as this does, 'Third edition, revised and illustrated,' there is little for the critic to do. This 'Manual' is the work of an experienced teacher, who has been singularly successful in conducting one of the largest educational institutions in England. It is primarily designed for the younger members of the profession, and to them it cannot fail to prove most helpful. We are glad to find that Mr. Park discourages the *slavish* use of these or of any other notes. There are fifty-two lessons, divided into the following four sections:—the Animated World, the Vegetable World, the Mineral Kingdom, and Industrial and Miscellaneous. The book abounds in excellent hints, and is appropriately illustrated. We cordially commend it.

The Elements of Physiography. By John J. Prince. London and Manchester: John Heywood.

This is a revised and enlarged edition of a book which has long been favourably known to the public. It contains a very large amount of information, expressed in a concise, intelligent manner, concerning everything connected with physical geography, and, to the student interested in that study, will prove a highly useful little text-book as well as a cheap one—a combination of merits which, as a rule, it is very difficult to find. The fact that the papers set at the Science and Art Department Examination for 1882 occur amongst those given at the end, and that the results of the *Challenger* expedition, and Mr. Proctor's theories respecting meteors, etc., are embodied in the text, prove that considerable care has been taken to bring the book up to date. We cordially recommend it.

The Old Waggon; or, the Old Life and the New. By A. Rycroft Taylor. Manchester and London: J. Heywood.

This is a tale with no particular interest to the general reader, though, as it forms one of a series, we presume there are people who like this style of literature.

Meg, the showman's daughter, is so ladylike and high principled, that the wonder is how she, living in a waggon, learnt such good manners; while equally impossible in real life—and we think that fiction should as nearly resemble truth as possible—would be the change from penury to wealth, especially when, as in this case, it seems to be received almost as a matter of course by the fortunate recipients.

Our Little Ones. London: Griffith and Farran.

As we turn over the leaves of this charmingly illustrated magazine, the wonder to us is how it can be produced at the price. It is the best threepennyworth we have seen.

National Grammar. In Four Parts. Standards II., III., IV., V. London: National Society Depository.

This series has much to recommend it. The booklets are clearly printed and carefully graduated, both in subject-matter and in the words and size of type employed. Throughout the series, the benefits of recapitulation have not been lost sight of, and by this means the fear of the child's forgetting, while working through one standard, what he has learned in the preceding, is materially lessened.

New National Poetry Cards. London: National Society's Depository.

We have received an assortment of poetry cards suitable for the first four Standards of the New Code, and have pleasure in bringing them under the notice of our readers. The 'poetry' has been wisely chosen, the explanatory notes are just what children need, and the card used is exceptionally stout. The series is an excellent one.

Notes of Lessons on our Lord's Life and Teaching. London: National Society's Depository, Westminster.

Sunday-school teachers, who have little or no time to prepare their own lessons, will find these notes by the Rev. Edwin Hobson of great use in examining their classes, as the subject for each Sunday is thoroughly gone into, and the questions and answers very clearly and simply put.

The book contains a lesson on some incident in our Lord's life, or some article of His teachings, for every Sunday in the Christian year.

[Several Reviews are unavoidably held over for want of space.]

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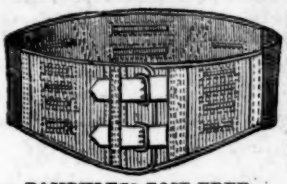

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